NOVEMBER

25 CENTS

Science and Invention

RAILWAY TO AIRWAY

Are Oil Burners Practical for the Home?

Sky-Hooks for Airplanes

When Inventors Become Air-Minded

Is Mediumship Based on Science?

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A NEW SCREEN GRID RECEIVER

Engineered to a new Height of Perfection

Here is a new receiver featuring a Screen Grid circuit—245 push-pull power audio—power detector—8 tubes—with A-C. All electric humless operation. A tuned detector stage imparts unusual power to the receiver. Ultra selective—sturdy construction—R C A licensed

FREE RADIO CATALOG

Send for this new, big catalog—196 pages full of the very latest in radio, such as this new Screen Grid Chassis, as well as many other special features. All priced to you at wholesale—offering remarkable values on everything in radio.

Our recent purchases totaling over one million ($1,000,000) dollars in standard radio receiving sets coupled with our tremendous stock of standard accessories, parts and kits has enabled us to make startling price reductions. *Write* today for the complete story as given in this large 196-page catalog of radio bargains.

EVERYTHING IN RADIO AT UNHEARD OF PRICES

New Screen Grid A. C. Humless All-Electric sets—standard A-C sets as well as battery operated receivers in an attractive array of consoles ranging from small table model types to gorgeous pieces of radio furniture. They represent the finest offerings of the season. The price range is especially attractive presenting unusual values as low as $15.95.

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A Reliable, High-grade Radio House

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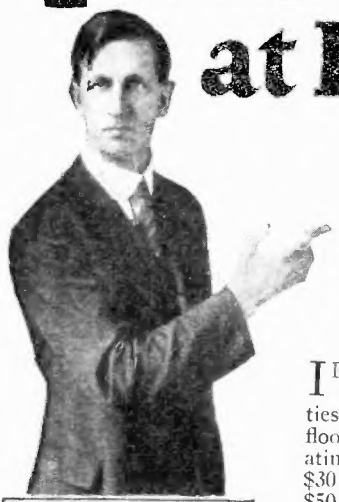
I Will Train You at Home to Fill a Big-Pay Radio Job



IF you are earning a penny less than $50 a week, send for my book of information on the opportunities in Radio. It's FREE. Clip the coupon NOW. A flood of gold is pouring into this new business, creating hundreds of big pay jobs. Why go along at $25, $30 or $45 a week when the good jobs in Radio pay $50, $75, and up to $250 a week. My book, "Rich Rewards in Radio," gives full information on these big jobs and explains how you can quickly become a Radio Expert through my easy, practical, home-study training.

Salaries of $50 to $250 a Week Not Unusual

Get into this live-wire profession of quick success. Radio needs trained men. The amazing growth of the Radio business has astounded the world. In a few short years three hundred thousand jobs have been created. And the biggest growth of Radio is still to come. That's why salaries of $50 to $250 a week are not unusual. Radio simply hasn't got nearly the number of thoroughly trained men it needs. Study Radio and after only a short time land yourself a REAL job with a REAL future.

You Can Learn Quickly and Easily in Spare Time

Hundreds of N. R. I. trained men are today making big money—holding down big jobs in the Radio field. Men just like you—their only advantage is training. You, too, can become a Radio Expert just as they did by our new practical methods. Our tested, clear training, makes it easy for you to learn. You can stay home, hold your job, and learn quickly in your spare time. Lack of education or experience is no drawback. You can read and write. That's enough.

Many Earn $15, $20, $30 Weekly on the Side While Learning

My Radio course is the famous course "that pays for itself." I teach you to begin making money almost the day you enroll. My new practical method makes this possible. I give you SIX BIG OUTFITS of Radio parts with my course. You are taught to build practically every type of receiving set known. M. E. Sullivan, 412 73rd Street, Brooklyn, N. Y., writes, "I made $720 while studying." Earle Cummings, 18 Webster Street, Haverhill, Mass.: "I made $375 in one month." G. W. Page, 1807 21st Ave., Nashville, Tenn.: "I picked up $935 in my spare time while studying."

Your Money Back If Not Satisfied

I'll give you just the training you need to get into the Radio business. My course fits you for all lines—manufacturing, selling, servicing sets, in business for yourself, operating on board ship or in a broadcasting station—and many others. I back up my training with a signed agreement to refund every penny of your money if, after completion, you are not satisfied with the course I give you.

Act Now—64-Page Book is FREE

Send for this big book of Radio information. It won't cost you a penny. It has put hundreds of fellows on the road to bigger pay and success. Get it. Investigate. See what Radio has to offer you, and how my Employment Department helps you get into Radio after you graduate. Clip or tear out the coupon and mail it RIGHT NOW.

J. E. SMITH, President
Dept. 9YT
National Radio Institute
Washington, D. C.

Here's the PROOF

$375 One Month in Spare Time

"Recently I made $375 in one month in my spare time installing, servicing, selling Radio Sets."
Earle Cummings,
18 Webster St.
Haverhill, Mass.

Jumped from $35 to $100 a Week

"Last week I had the pleasure of earning $110 servicing and selling Radio sets. I have made as high as $241 in two weeks. Before entering Radio I was making $35 a week. It is certainly great sport to do this kind of work."
J. A. Vaughn,
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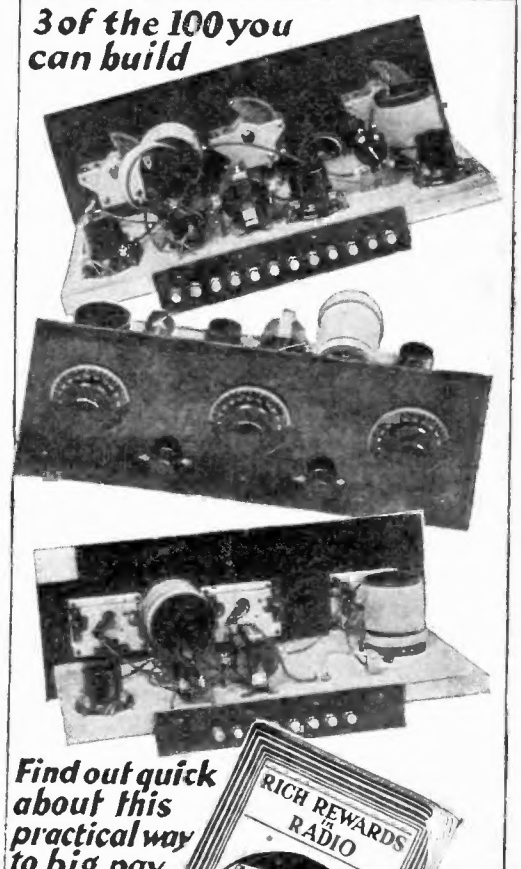
$450 a Month

"I work in what I believe to be the largest and best-equipped Radio shop in the Southwest and also operate KGFI. I am averaging $450 a month."
Frank M. Jones,
922 Guadalupe St.
San Angelo, Tex.

You can build 100 circuits with the six big outfits of Radio parts I give you

3 of the 100 you can build



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Dear Mr. Smith: Kindly send me your big book, "Rich Rewards in Radio," giving information on the big-money opportunities in Radio and your practical method of teaching with six big Outfits. I understand this book is free, and that this places me under no obligation whatever.

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Address .....

City ..... State.....

Occupation .....

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A. Hyatt Verrill, famous archeologist and tropical explorer, tells us in picture and story of the most remarkable palaces built of mud in Peru, which would be washed away if a heavy rain storm ever struck them.

World's Largest Airport—Where Is It?

Illustrated description showing some of the remarkable engineering features which involve the reclaiming of otherwise useless ground, and how even the hills are being removed by water.

40,000 Horsepower From a 3-Foot Pipe

How electric power is being developed from the highest head water-power plant in America—illustrated.

How Sound Indicates Height and Depth

Now giant zeppelins and other aircraft, as well as ships, can measure heights and depths by discharging a bomb, and measuring the time for the echo to arrive.

Is Used Oil Better Than New?

Mr. William F. Matthews tells the surprising story of a new process, whereby your used automobile engine oil can be cleansed and made superior to new oil.

VOL. XVII Whole Number 199 November, 1929, Number 7

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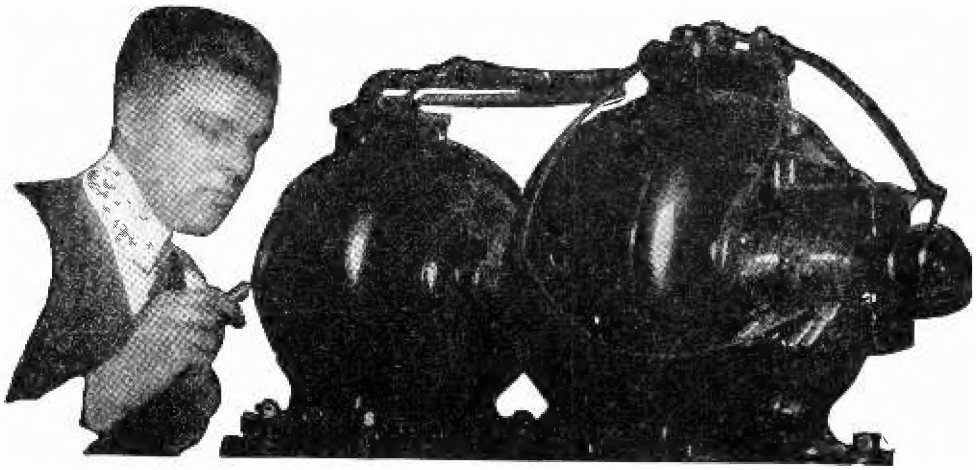

Amazingly Easy Way to get into ELECTRICITY

Don't spend your life waiting for $5 raises in a dull, hopeless job. Now . . . and forever . . . say good-bye to 25 and 35 dollars a week. Let me show you how to qualify for jobs leading to salaries of $50, $60 and up, a week, in Electricity—NOT by correspondence, but by an amazing way to teach, that makes you an electrical expert in 90 days! Getting into Electricity is far easier than you imagine!

Learn Without Lessons in 90 DAYS

Lack of experience—age, or advanced education bars no one. I don't care if you don't know an armature from an air brake—I don't expect you to! I don't care if you're 16 years old or 48—it makes no difference! Don't let lack of money stop you. Most of the men at Coyne have no more money than you have.

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I will allow your railroad fare to Chicago, and if you should need part-time work I'll assist you to it. Then, in 12 brief weeks, in the great roaring shops of Coyne, I train you as you never dreamed you could be trained . . . on the greatest outlay of electrical apparatus ever assembled in any electrical school . . . costing hundreds of thousands of dollars . . . real dynamos, engines, power plants, autos, switchboards, transmitting stations . . . everything from doorbells to farm power and lighting . . . full-sized . . . in full operation every day!

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Here are a few of hundreds of positions open to Coyne-trained men. Our free employment bureau gives you lifetime employment service.

Armature Expert, to $100 a Wk.
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$60 a Week und up
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Inventor . . . . . Unlimited
Maintenance Engineer
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up to $200 a Week
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No Books-No Printed Lessons

No books, no baffling charts . . . all real actual work . . . right here in the great Coyne school . . . building real batteries . . . winding real armatures, operating real motors, dynamos and generators, wiring houses, etc., etc. That's a glimpse of how we make you a master practical electrician in 90 days, teaching you far more than the average ordinary electrician ever knows and fitting you to step into jobs leading to big pay immediately after graduation. Here, in this world-famous *Parent school*—and nowhere else in the world—can you get such training!

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Dont' worry about a job, Coyne training settles the job question for life. Demand for Coyne men often exceeds the supply. Our employment bureau gives you a lifetime service. Two weeks after graduation, Clyde F. Hart got a position as electrician for the Great Western Railroad at over $100 a week. That's not unusual. We can point to Coyne men making up to $600 a month. $60 a week is only the beginning of your opportunity. You can go into radio, battery, or automotive electrical business for yourself and make up to $15,000 a year.

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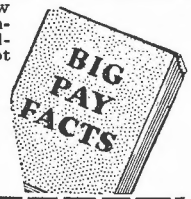

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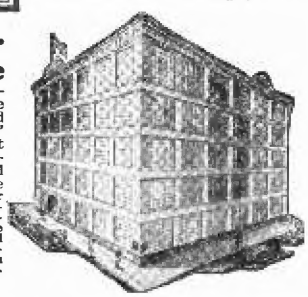
This is our new, fireproof, modern home wherein is installed thousands of dollars' worth of the newest and most modern Electrical Equipment of all kinds. We now have the largest amount of floor space devoted to the exclusive teaching of practical electricity in the world. Every comfort and convenience has been arranged to make you happy and contented during your training.



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Is This the Ultimate Airplane?

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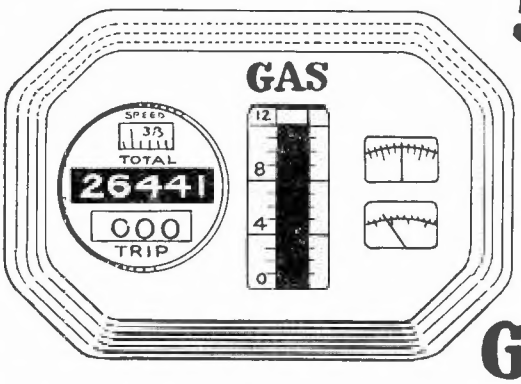
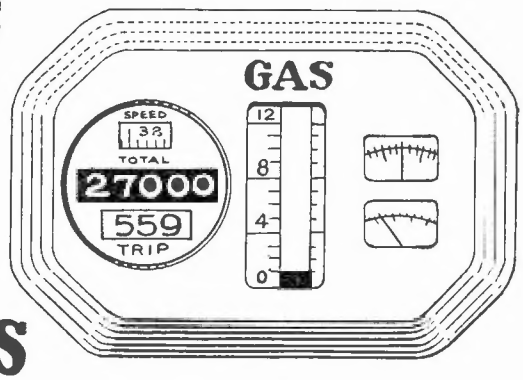
Over the Mountains from Los Angeles



559 Miles on 11 Gallons of GAS



Think of it! FIVE HUNDRED FIFTY-NINE MILES over rough mountainous country burning only ELEVEN GALLONS OF GASOLINE. Imagine more than FIFTY MILES to the GALLON. This is what the WHIRLWIND CARBURETING DEVICE does for D. R. Gilbert, enough of a saving on just one trip to more than pay the cost of the Whirlwind.

THE WHIRLWIND SAVES MOTORISTS MILLIONS OF DOLLARS YEARLY

Whirlwind users, reporting the results of their tests, are amazed at the results they are getting. Letters keep streaming into the office telling of mileages all the way from 22 to 59 miles on a gallon, resulting in a saving of from 25 to 50% in gas bills alone.

Mark H. Estes writes: "I was making 17 miles to the gallon on my Pontiac Coupe. Today, with the Whirlwind, I am making 35 5/10 miles to the gallon. Am I glad I put it on? I'll say so!"

P. P. Goerzen writes: "I made an actual test both with and without a Whirlwind, getting 13½ miles without and 34 6/10 miles with the Whirlwind, or a gain of 21 miles to the gallon. The longer the Whirlwind is in use on the machine, the better the engine runs, has more pep and quicker starting. It makes a new engine out of an old one, and starts at the touch of the starter button."

R. J. Tulp: "The Whirlwind increased the mileage on our Ford truck from 12 to 26 miles to gallon and 25% in speed. We placed another on a Willy's Knight, and increased from 12 to 17 miles per gallon.

Arthur Grant: "I have an Oakland touring car that has been giving me 15 miles to the gallon average, but I can see a great difference with the Whirlwind, as it climbs the big hills on high and gives me better than 23 miles to the gallon of gas, which is better than 50% saving in gas."

W. A. Scott: "I had my Whirlwind for three years. Winter and summer it gives the same perfect service, instant starting, smoother running, and what I saved in gasoline these last few years has brought other luxuries which I could not have afforded previously."

Car owners all over the world are saving money every day with the Whirlwind, besides having better operating motors. Think what this means on your own car. Figure up your savings—enough for a radio—a bank account—added pleasures. Why let the Oil Companies profit by your waste. Find out about this amazing little device that will pay for itself every few weeks in gas saving alone.

FITS ALL CARS

In just a few minutes the Whirlwind can be installed on any make of car, truck, or tractor. It's actually less work than changing your oil, or putting water in the battery. No drilling, tapping or changes of any kind necessary. It is guaranteed to work perfectly on any make of car, truck or tractor, large or small, new model or old model. The more you drive the more you will save.

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Free Sample and $100.00 a Week Offer

Whirlwind men are making big profits supplying this fast-selling device that car owners cannot afford to be without. Good territory is still open. Free sample offer and full particulars sent on request. Just check the coupon.

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No matter what kind of a car you have—no matter how big a gas eater it is—the Whirlwind will save you money. We absolutely guarantee that the Whirlwind will more than save its cost in gasoline alone within thirty days, or the trial will cost you nothing. We invite you to test it at our risk and expense. You are to be the sole judge.

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Gentlemen: You may send me full particulars of your Whirlwind Carbureting device and free trial offer. This does not obligate me in any way whatever.

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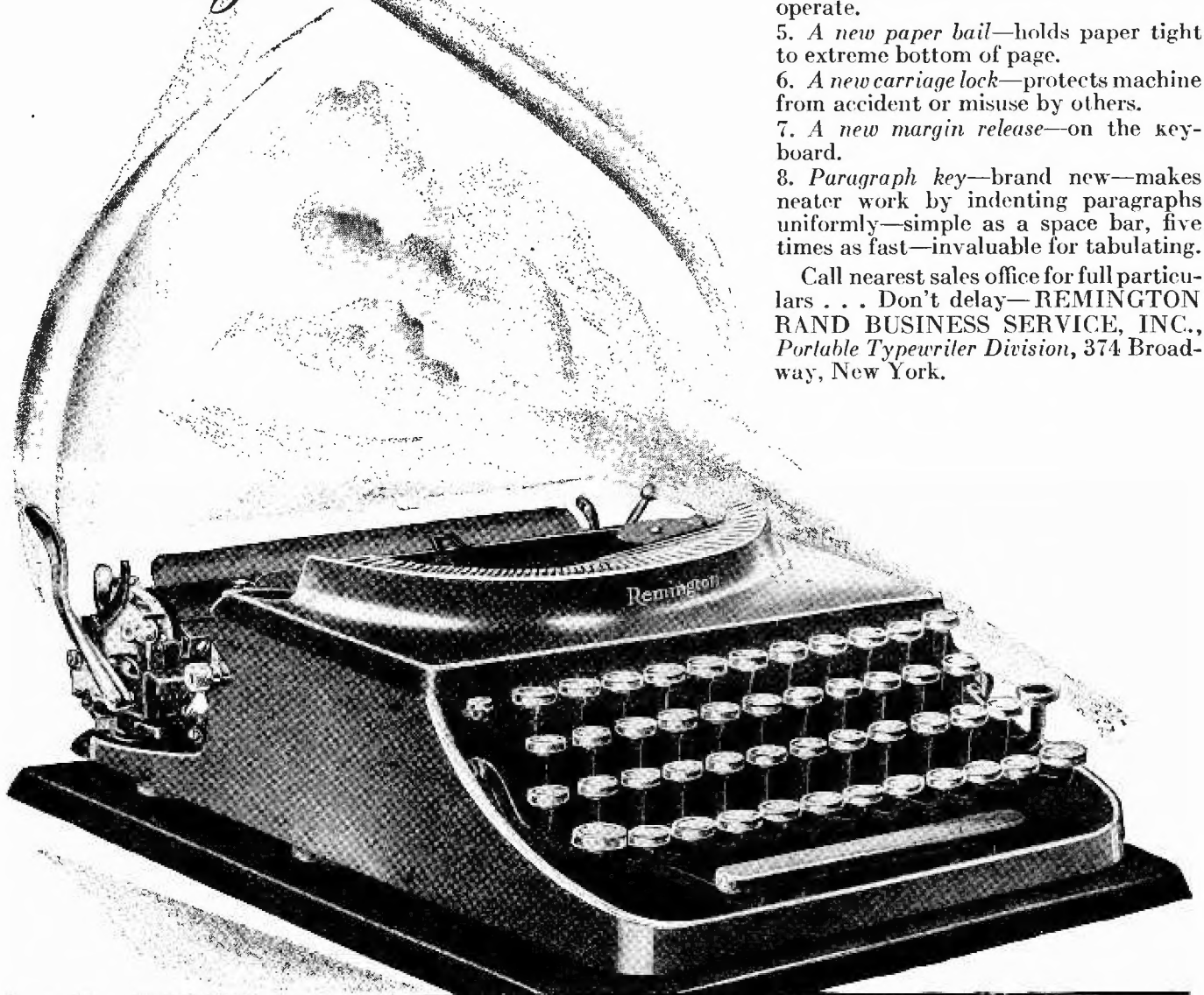
7. *A new margin release*—on the keyboard.
8. *Paragraph key*—brand new—makes neater work by indenting paragraphs uniformly—simple as a space bar, five times as fast—invaluable for tabulating.

Call nearest sales office for full particulars . . . Don't delay—REMINGTON RAND BUSINESS SERVICE, INC., *Portable Typewriter Division*, 374 Broadway, New York.



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"That's But the Third of the 40 Easy Ways — to make $3.00 An Hour Spare Time In Radio"

Wiring rooms for Radio—as usual, our members are among the first to cash in on it, because the Association was on the job in advance of the trend, preparing its members for this newly developing easy way to make money in radio. It is but one of the many easy ways by which Association-trained men are making $25 to $75 a week in spare time, $50 to $200 a week full time —easy ways you, too, can follow.

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Join the Radio Training Association and take advantage of the proven ways by which you can make $3.00 an hour upwards from the day you join. Our members are cleaning up on them and at the same time preparing for the $10,000 to $25,000 openings in Radio. The Association is helping men start businesses without capital, finance inventions, increase their pay, pass licensed operator's examinations, get better positions. No matter what you want out of Radio, the Association can help you get it easier and quicker. Learn what the Association has done for others and can do for you.

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— over $200,000,000 will be spent on them by their owners?

— every phonograph owner is a prospect for the services of an Association member?

— our Free Radio Hand-book will open your eyes?

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H. L. Schweber, Ill. — "After graduating I secured a position with a large Radio manufacturer. In two months I was given complete charge of a factory. My income has increased 300% since I joined the Association."

Clears $3,000.00

Frank J. Deutch, Pa.—"Since joining the Association I have cleared nearly $3,000.00. I don't see how a man can fail, no matter how little education he has, if he follows your easy ways of making money."

$1,100.00 In 6 Weeks

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A limited number of these memberships now available! Write for one today! It need not—should not—cost you a cent. Write for the inspiring story of what the Association has done for other ambitious men. Learn how it can help you make more money now and later. Fill out and mail in the coupon now—right now—without fail.

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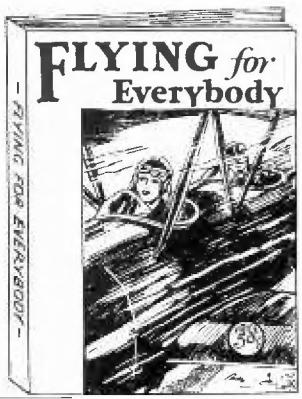

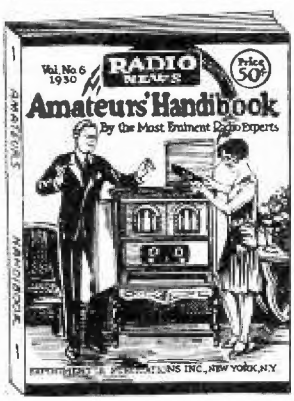

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Sometimes called the Radio Amateur's Bible. Includes 10 How-to-Build articles, with complete instructions and diagrams; new radio wrinkles, DX hints, data on the new tubes, answers to AC problems, and helpful, money-saving ideas for the radio service man. 96 illustrated pages. Large 9 by 12 inch size. Beautiful colored cover. Price postpaid **50c**

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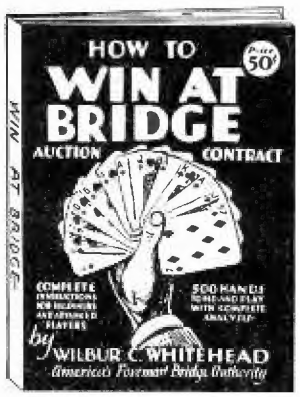

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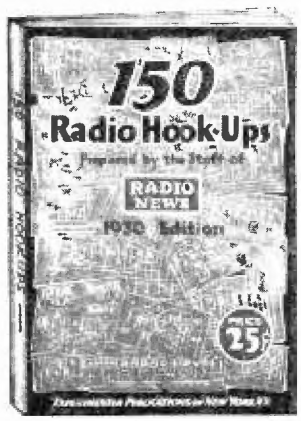

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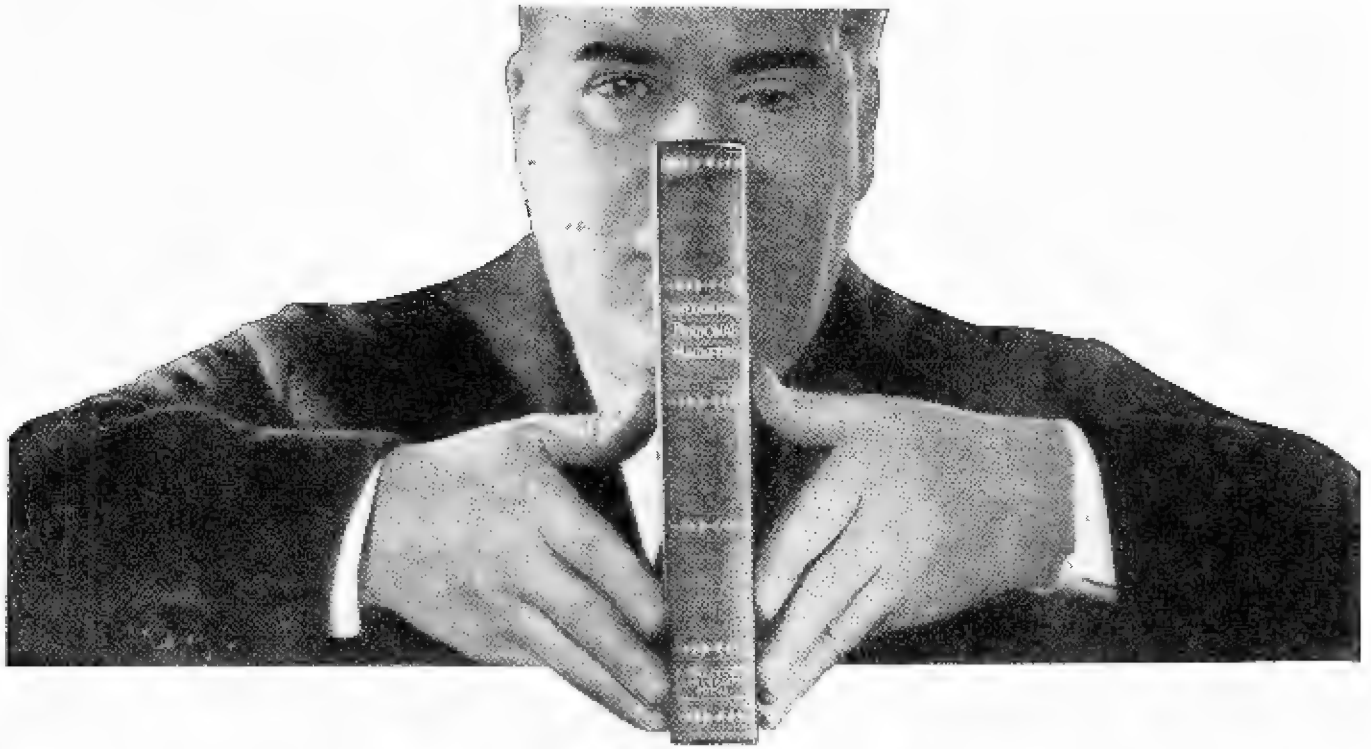

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VOLUME XVII
WHOLE NO. 199

Science and Invention

NOVEMBER, 1929
NUMBER 7

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"Those Who Refuse to Go Beyond Fact Rarely Get as Far as Fact" - - - - - *HUXLEY*

Safety on Our Airways?

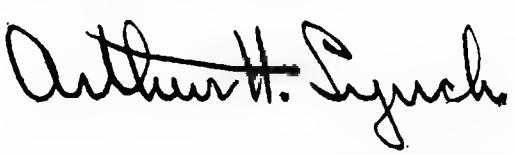
POSSIBLY nothing could have saved the lives of the passengers and crew of the trans-continental airport liner "City of San Francisco," on which eight were lost when the ship struck the side of a mountain in a desolate section of the West. There is some possibility, however, that these lives might have been saved had it been possible for the pilots to receive definite weather information and change their course to avoid the storm center or to postpone their departure.

Wrecking a few ships of this character will do a great deal of harm to aviation, and we believe that it would be highly desirable for the Department of Commerce to take immediate steps for the provision of a law requiring radio equipment on air liners carrying passengers and operating over sparsely settled territories, similar to that of the law which requires radio equipment upon passenger-carrying marine liners.

Until such a law is enforced, and we have no doubt that sooner or later it will be, properly organized air transportation companies will make every effort themselves to provide their lines with suitable radio equipment. and they will organize, as some of them are already doing, a complete radio network which will enable the pilots to communicate with landing fields at all times and will enable all of the fields to communicate with each other.

Most of the air-line operators have already recognized the importance of the best possible radio communication facilities for the proper conducting of their operations, but when it becomes necessary for all of the ships on our trans-continental service to abandon their normal functioning, in order to take part in a search for a single plane, it is quite obvious that there is plenty of room for improvement.

We believe that aviation in this country will progress with just about the same speed that aviation radio progresses and that the air lines which are to make the greatest progress in the shortest time will be those which avail themselves of the radio facilities already at hand. Realizing its importance, passengers will soon demand suitable radio for their own protection.



Editorial Director

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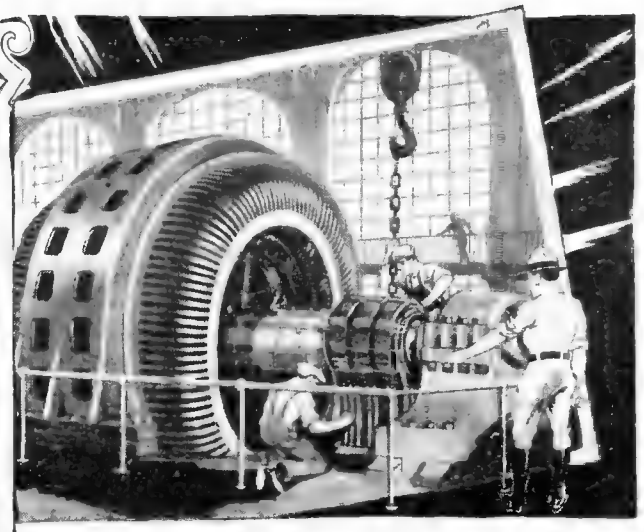
You Fellows Who Want BIG PAY Get Into ELECTRICITY



WHY earn $15 or $20 or $30 a week, when in the same six days as an Electrical Expert, you can make $60 to $100— and do it easier—not work half so hard. Why, then, remain in a small-pay, no-future job that offers no chance for big promotion — no chance for big income? Fit yourself for a real job. **Get into Electricity.** That's where the big money is being made, and always will be made.

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I'll train you at home—in your spare time. You work just as you are working now — at your same job. My now famous "Work-Sheet and Job-Ticket" method guarantees you simplified, practical training along work-shop lines. In a few short months you can step out of your old job into a new job—into electrical work where you can be a Big-Pay man in this Big-Pay field.

You Earn As You Learn

To learn Electricity my way you don't have to be a College man, or even a High School graduate. You can read. You can write. That's enough. With me, you get experience as you go along and make good money while learning. I'll show you how—and I'll give you, without extra cost tools and apparatus to work with — 6 Big Outfits in all.

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That's what I agree to do. And back of me in this agreement stands the Chicago Engineering Works, a $2,000,000 Illinois Corporation. There's nothing like "Cooke" Training, anywhere. It's the Training that big Electrical men are praising; it's the Training that employers recommend; it's the Training that one of our greatest Engineering societies, has endorsed 100 percent. **It's the Training for you.**

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Dear Mr. Cooke: Since finishing your Course I have been doing very well in my own electrical business. But recently I was offered the job of Chief Electrician for a Big Coal Mine. I took the job, at $12,000 a year.

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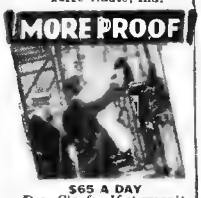

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Dear Chief: If it wasn't for your wonderful course I wouldn't now be making as high as $65 a day. It makes me proud to have your Diploma, and believe me I am a booster for your Course.

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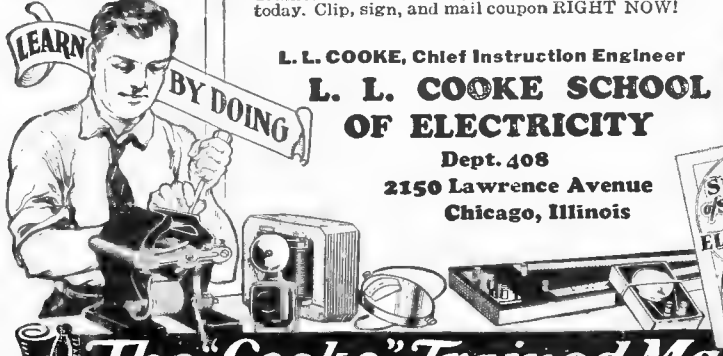
W. E. PENCE,
Box 921, Palo Alto, Calif.

6 BIG OUTFITS TOOLS-APPARATUS GIVEN



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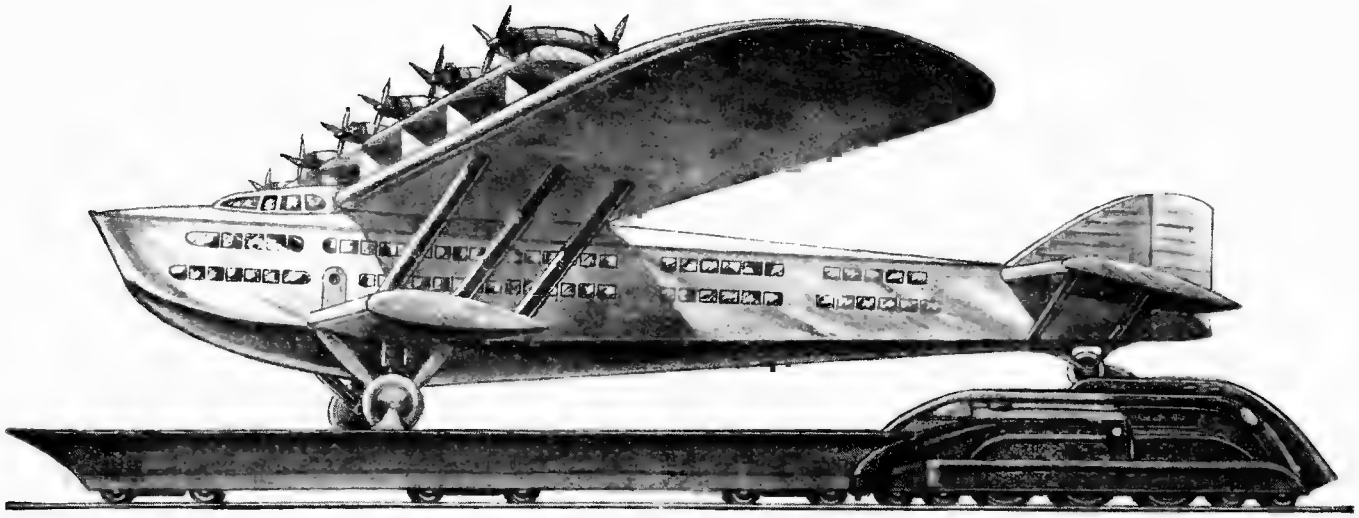
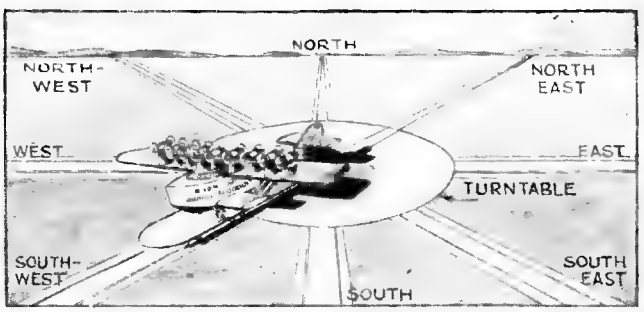


Side view of huge electric engine for launching giant planes.

Railway to AIRWAY

Hurling Giant Planes Into the Air With Huge Locomotives

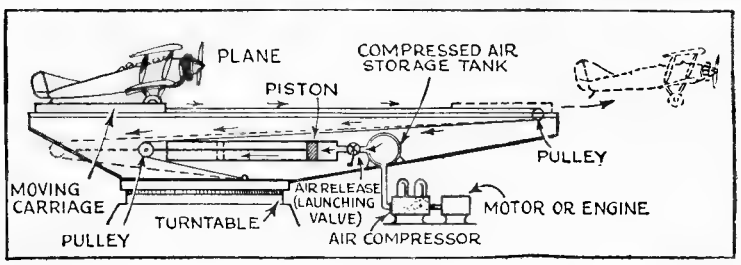
By Harold Donitz



COLONEL JAMES FITZ-MAURICE was recently credited with the opinion that the future transatlantic air commerce would be served by gigantic flying boats, and that while these usually take off from the surface of a bay or lake, it was not unlikely that some means would be devised to launch them from the platform of a railroad car. Clarence Chamberlin, famous American flier, stated in a letter to the author that the idea seemed entirely practical for heavily loaded planes about to start on long flights.

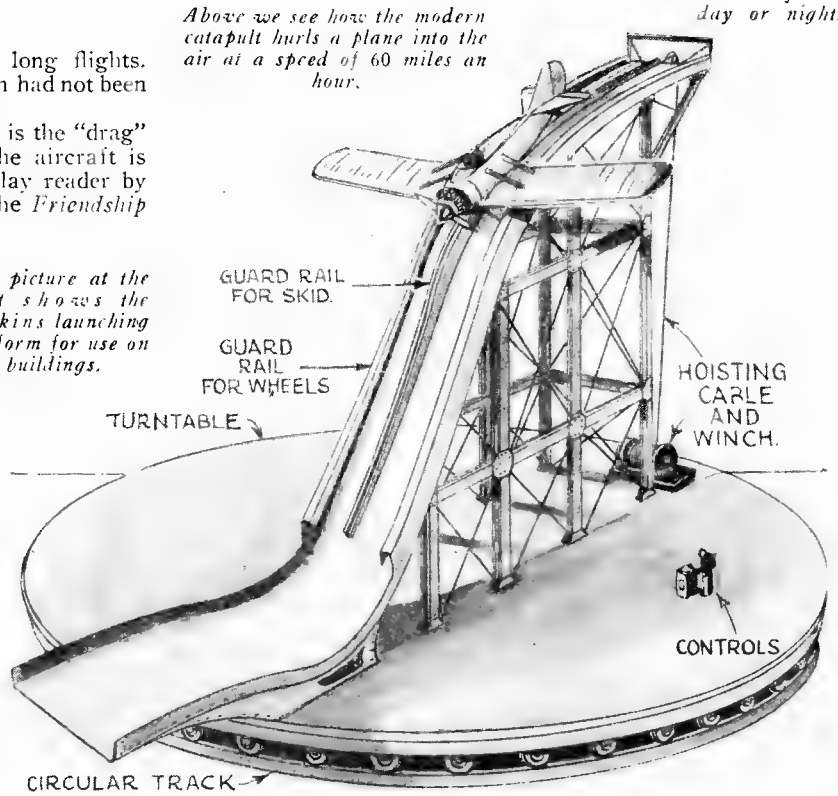
To the best of our knowledge, this proposition had not been voiced before and has not been stressed since.

One of the greatest difficulties of flying boats is the "drag" exerted by even the smoothest water when the aircraft is taking off. This drag was manifested to the lay reader by the many futile attempts to take off made by the *Friendship* before its transatlantic hop. Indeed, the drag was only overcome after the weight of the plane had been lessened by reducing (*Continued on page* 640)

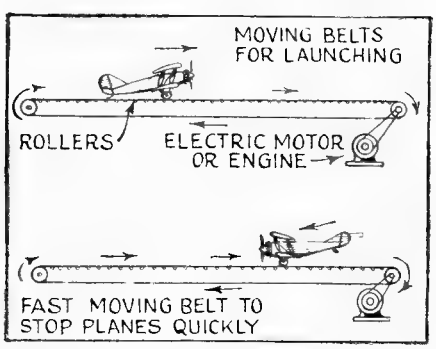


Above we see motor-operated turn-table, together with tracks facing in various directions of the compass, thus enabling the pilot to take off into the wind at any time of the day or night.

Above we see how the modern catapult hurls a plane into the air at a speed of 60 miles an hour.



The picture at the right shows the Jenkins launching platform for use on buildings.



Moving belts operating in a similar manner to the tread on the old "horsepower" machines may be very well put to work for the launching and landing of aircraft, as shown in the diagram above.

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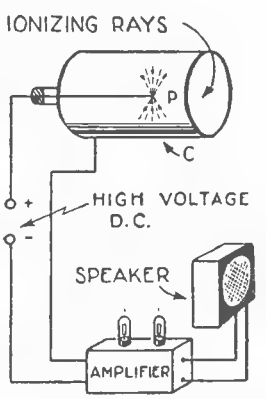
Did You Ever Hear An Atom Talk?

THE atom has been given a voice and it talks loud enough to be broadcast over the radio and be heard all over the world. This is made possible by means of the Geiger apparatus. The alpha particles emitted by the radioactive substances enter the air chamber through a thin aluminum "window," before which the substance is held. The particles ionize, or render electrically conducting, the air within the chamber; and the current thereby produced is amplified sufficiently by the apparatus, so that the effect of the explosion of the radioactive atom is heard as a sharp click in the radio speaker. The speaker of the apparatus was placed in front of the broadcasting microphone for the demonstration. The atoms given off from uranium give sounds like explosions. They can be heard and counted by means of this apparatus. They are heard as a series of loud clicks.

When the uranium is kept at a distance the clicks come slowly so that they may be easily counted.

It has long been possible to see the atoms given off from radioactive substances, but the Geiger apparatus makes it also possible to hear them.

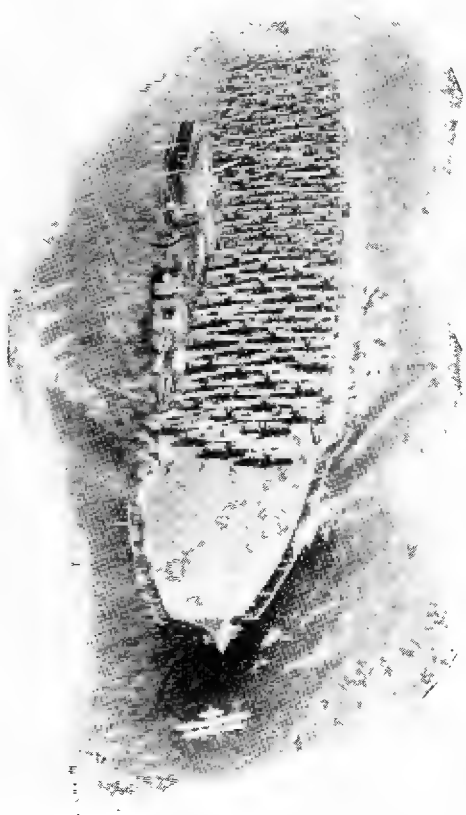
The recording and amplifying unit of the listening apparatus is shown above. A piece of rare uranium is shown in the inset.



Apparatus which makes an atom's activity audible.

A Floating Hornets' Nest

WHEN it becomes possible to release eighty fighting and bombing planes from an airplane carrier like the one shown, it is well to consider the potentialities of airplanes in naval warfare. Such a squadron would cost approximately $1,000,000 as compared to the $40,000,000 which is the cost of a modern battleship. Authorities state that a fighting squardron of airplanes would be able to disable or sink a whole fleet of battleships. The personnel of a squadron of eighty planes would be one hundred and sixty men, which is about one-tenth of the number of men on a battleship, so that if it were possible to destroy the whole fleet of airplanes, the loss of men would only be one-tenth as great as that in the sinking of one battleship. One wonders whether it will pay to build more battleships.



This view of the U. S. S. Saratoga shows fighting and bombing planes being discharged while at sea.

You Can Sass This Cop!

THE ideal traffic cop, one whom you can talk back to as much as you please, has been invented by T. A. Van Gundy of San Gabriel, California. It is called the duo-differential signal. The signal is a two-faced man who, with mechanical precision, will direct traffic. When the direction of traffic is to be changed, the cop waves its hands, in which are electric lights, blows its whistle and then turns. What a riot when police parade takes place.

A model of the duo-differential traffic cop is shown here. The traffic cop's companion is Miss Ellen Boyd. This mechanical scion of the law will not vary in efficiency, as he is not susceptible to the distractions of beautiful damsels lightly tripping across the thoroughfares. His uniform is a coat of paint and offers no problem to sartorial prognosticators.

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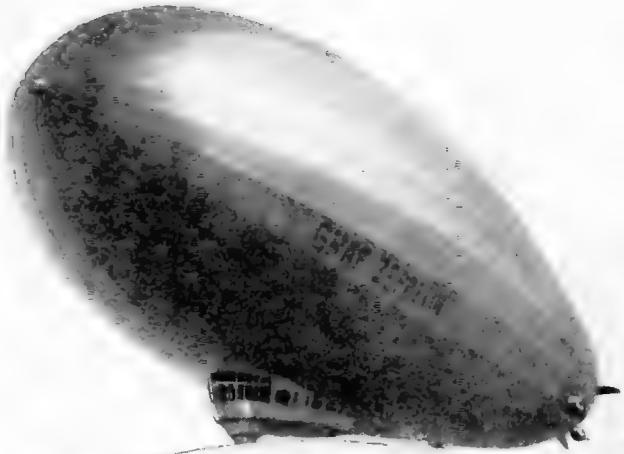
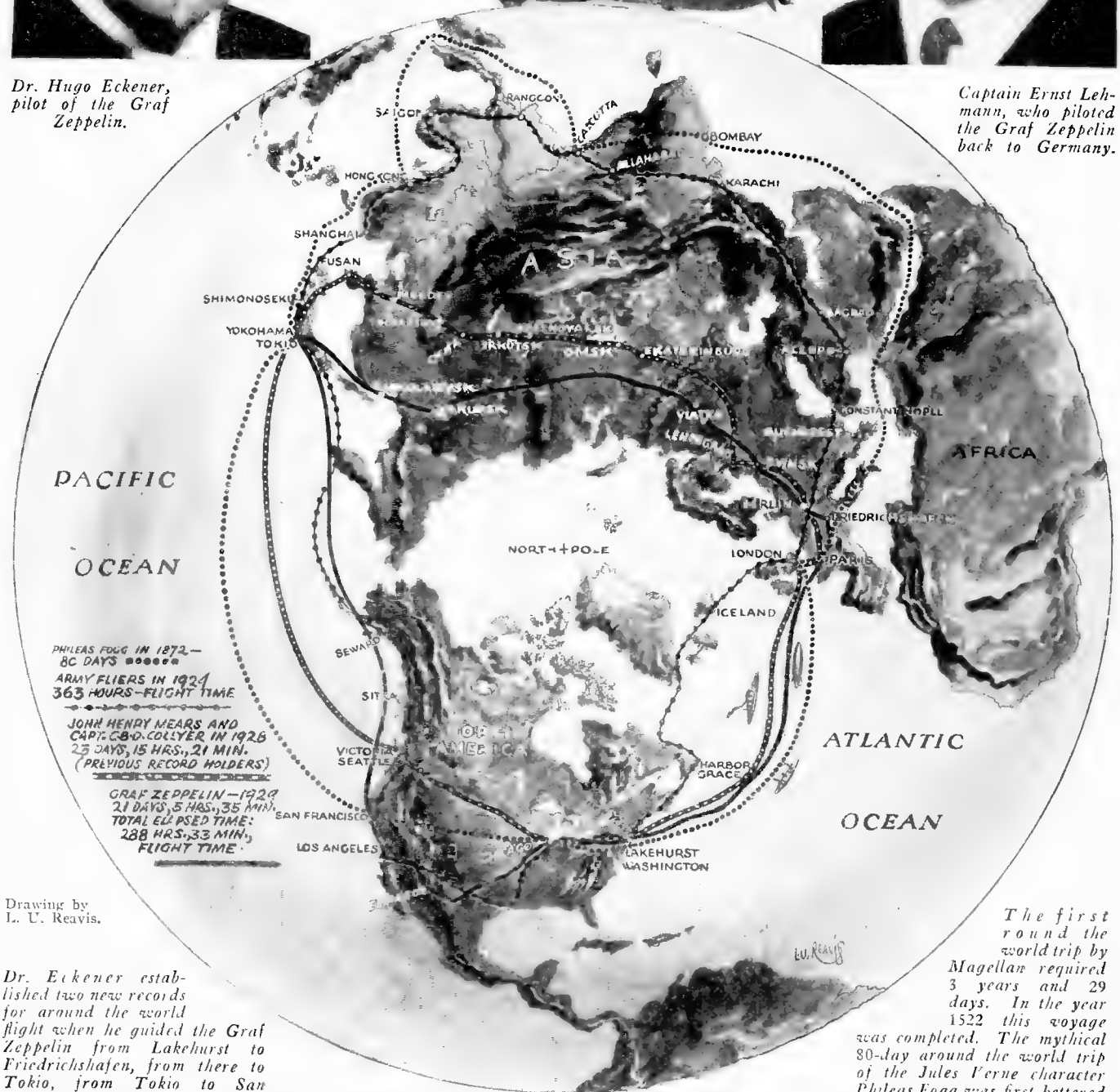
Zep Beats All Other World-Girdlers!

Dr. Hugo Eckener, pilot of the Graf Zeppelin.



Captain Ernst Lehmann, who piloted the Graf Zeppelin back to Germany.



Drawing by L. U. Reavis.

Dr. Eckener established two new records for around the world flight when he guided the Graf Zeppelin from Lakehurst to Friedrichshafen, from there to Tokio, from Tokio to San Francisco and from San Francisco back to Lakehurst in 21 days, 5 hours and 35 minutes, total elapsed time and 288 hours, 33 minutes, flight time. This betters the previous record of Mears and Collyer more than 2¼ days.

The first round the world trip by Magellan required 3 years and 29 days. In the year 1522 this voyage was completed. The mythical 80-day around the world trip of the Jules Verne character Phileas Fogg was first bettered by Nelly Bly. The most notable voyages and the time required are indicated on the map. The Graf Zeppelin, under the guidance of Captain Lehmann, after breaking the dual record, then traveled to Germany and broke her own record again.

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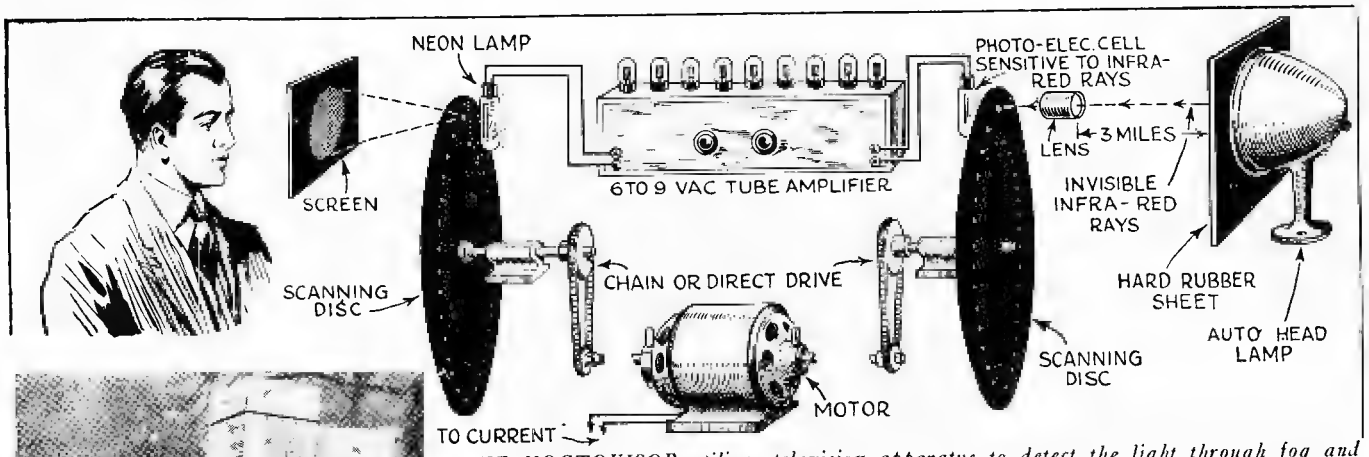
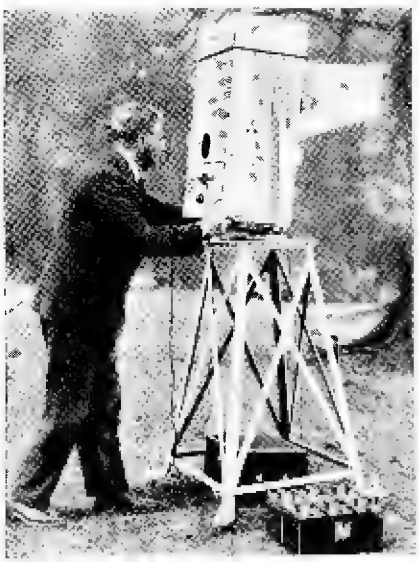




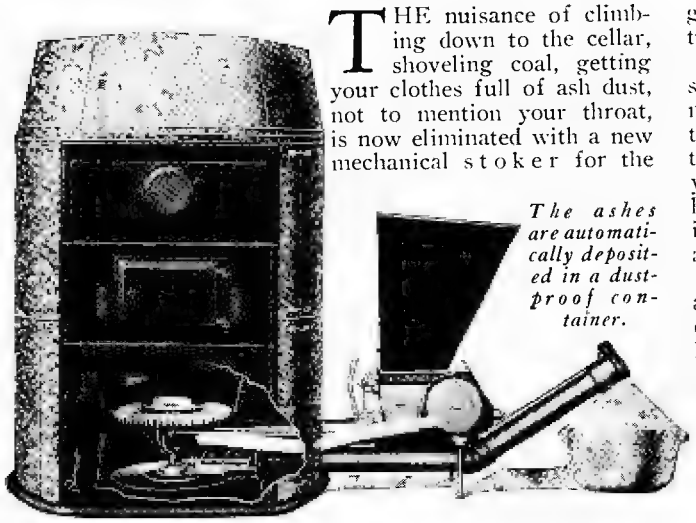
THE NOCTOVISOR utilizes television apparatus to detect the light through fog and amplify the impulses so that they will activate the neon lamp. Mr. Baird is shown directing his NOCTOVISOR on some distant light. The device is a combination of camera lens, television transmitter, and television receiver.

How Baird Sees Through Fog With Dark Rays

AN invisible eye that can see in the dark and detect the light of a ship two miles away on a black foggy night has been invented by John Baird of television fame. He calls the invention a *Noctovisor*. It looks something like a large camera and can be mounted on a ship or airplane. At a recent demonstration, Mr. Baird was able to pick up light rays at a distance of several miles through fog. A light which was placed 2½ miles away and which was obscured by a sheet of ebonite as a substitute for a supposed fog 2 miles thick, appeared on the noctovisor screen as a bright red disc.

This device will have particular value in permitting a navigator in a fog to tell the exact direction of a beacon and to estimate roughly its distance, when it would be invisible otherwise.

Coal In—Ashes Out—Thank Robot Janitor



The ashes are automatically deposited in a dust-proof container.

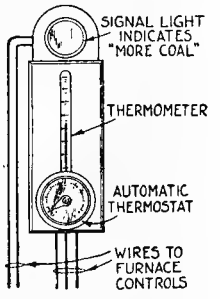
THE nuisance of climbing down to the cellar, shoveling coal, getting your clothes full of ash dust, not to mention your throat, is now eliminated with a new mechanical stoker for the home, which is completely automatic in operation and control.

It automatically feeds the coal and fuels the furnace by the economical underfeed method, which entirely eliminates all soot and smoke. It also automatically shakes the grates and removes the ashes—all these functions being controlled by an electric thermostat and a small, silent electric motor.

Thermostatically controlled, it insures perfect combustion, saving coal and insuring more heat per ton of coal consumed than is possible with the most careful hand feeding. Besides, it makes possible the use of the cheaper grades for home heating and maintains a uniform temperature at all times.

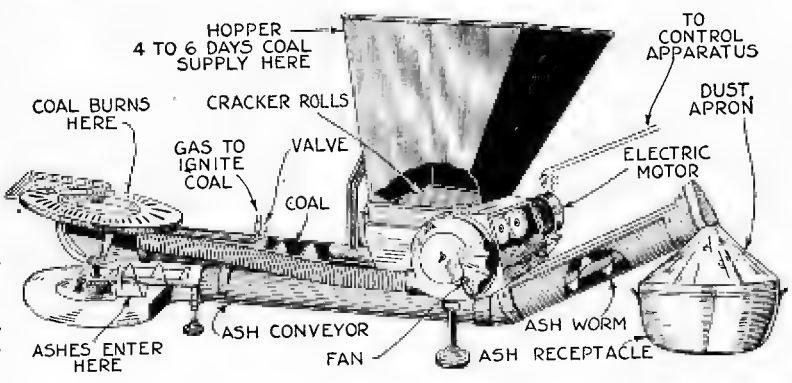
The hopper needs filling only once or twice a week, and a signal light in the room above tells you when refilling is needed. The stoker requires no attention other than filling the hopper and emptying or removing the ash can two or three times a week—and the thermostat signal is there to tell you when it is time to do that. The hopper holds 400 pounds of coal, which is three or four days' supply in the average home.

Dust-proof ash can holds a week's accumulation of ashes. Fluted cast-iron cracker rolls crash any lump of coal too large for the feed worm, and shearing pin safety device on the gear box protects the gears against non-crushable foreign matter which might get into the coal supply.



Electric Thermostat.

The Uniflow stoker can be installed in any make, size or shape, hot air, hot water, steam or vapor domestic furnace—either through the side of the furnace or the ash pit door. It burns the cheaper sizes of coal.



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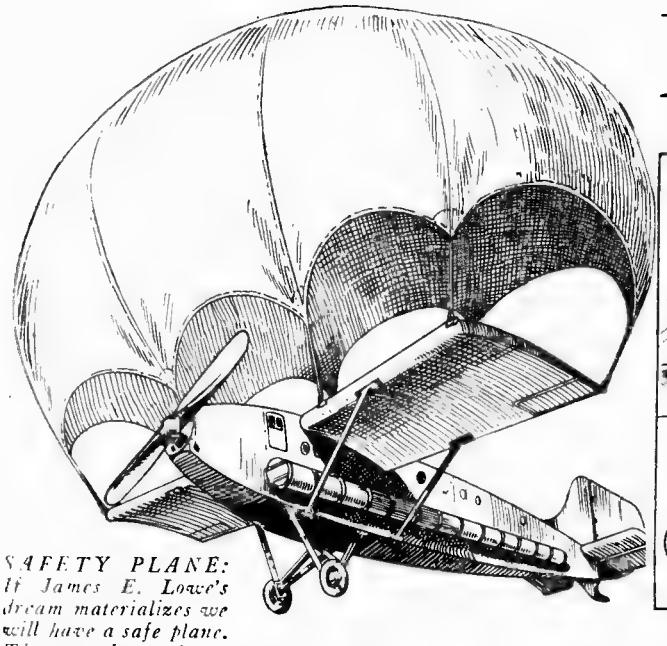
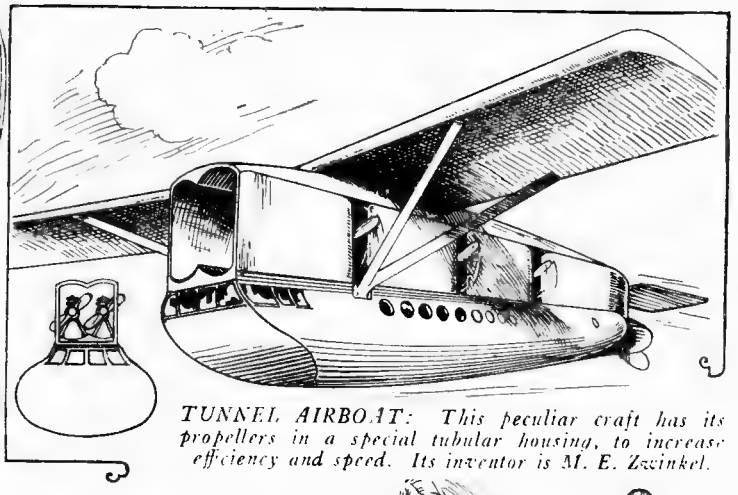
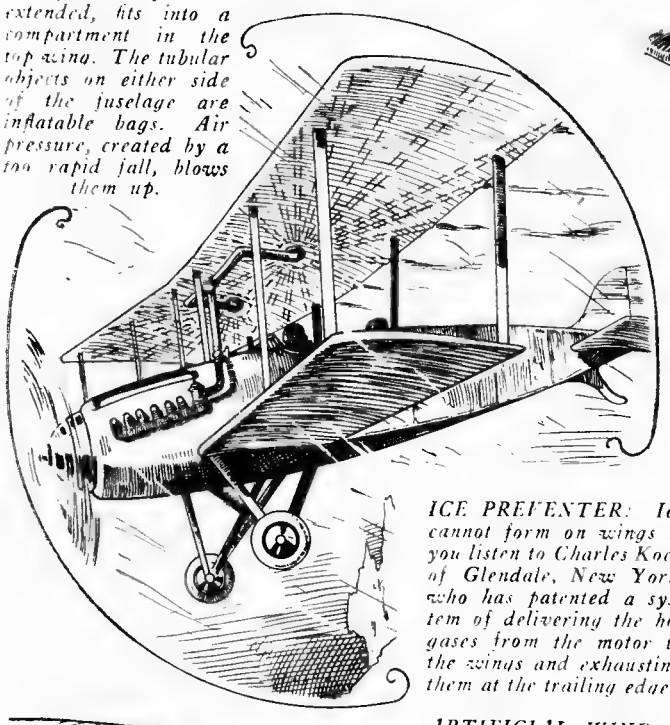
New Aviation



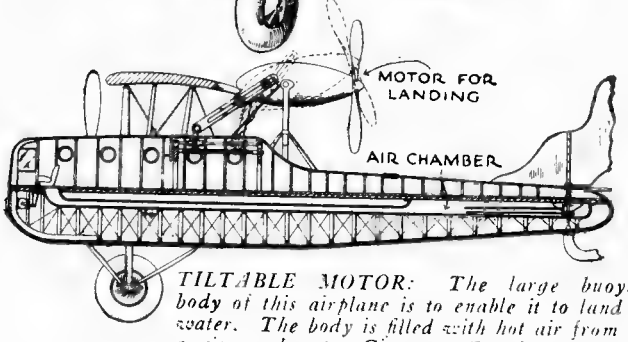
SAFETY PLANE: If James E. Lowe's dream materializes we will have a safe plane. The parachute, shown extended, fits into a compartment in the top wing. The tubular objects on either side of the fuselage are inflatable bags. Air pressure, created by a too rapid fall, blows them up.



TUNNEL AIRBOAT: This peculiar craft has its propellers in a special tubular housing, to increase efficiency and speed. Its inventor is M. E. Zwinkel.

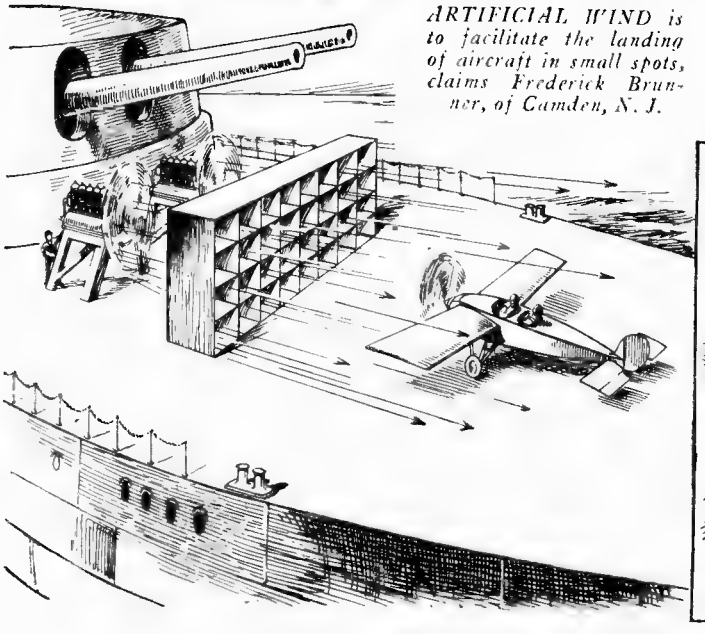


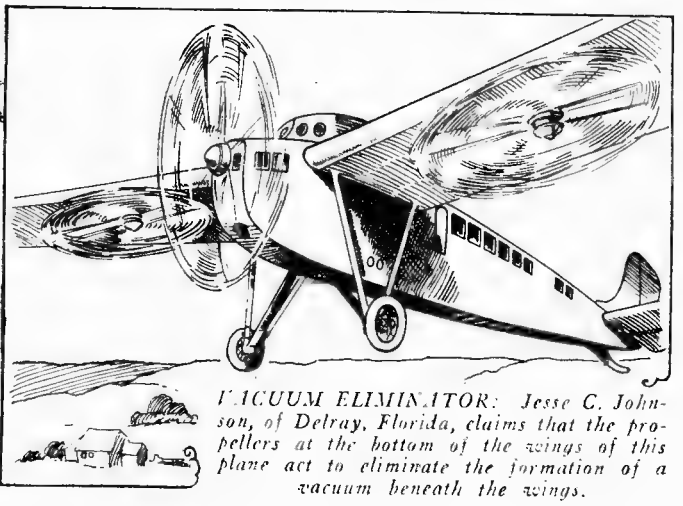
ICE PREVENTER: Ice cannot form on wings if you listen to Charles Koch of Glendale, New York, who has patented a system of delivering the hot gases from the motor to the wings and exhausting them at the trailing edges.



TILTABLE MOTOR: The large buoyant body of this airplane is to enable it to land on water. The body is filled with hot air from the engine exhaust. Giuseppe Cannistra suggests that the tiltable motor be used for landing.

ARTIFICIAL WIND is to facilitate the landing of aircraft in small spots, claims Frederick Brunner, of Camden, N. J.





VACUUM ELIMINATOR: Jesse C. Johnson, of Delray, Florida, claims that the propellers at the bottom of the wings of this plane act to eliminate the formation of a vacuum beneath the wings.

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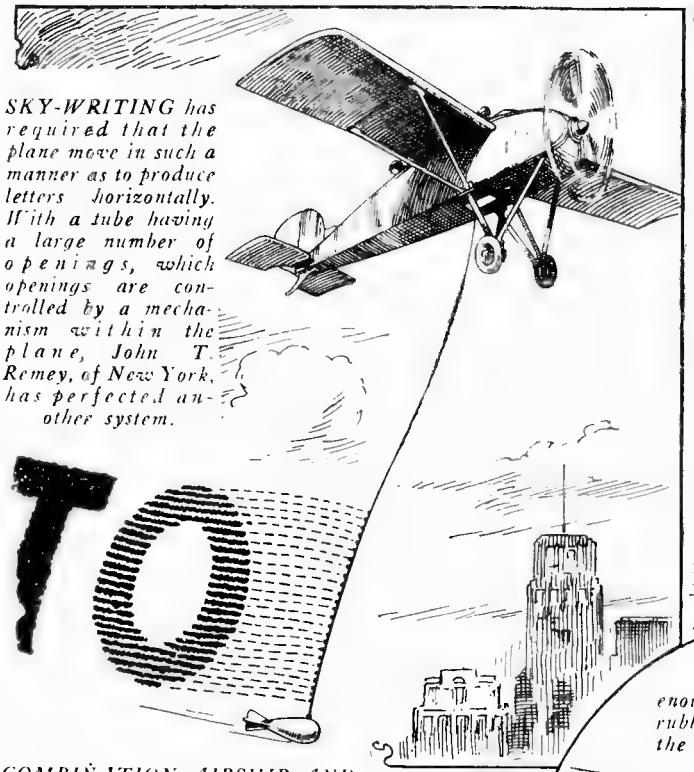
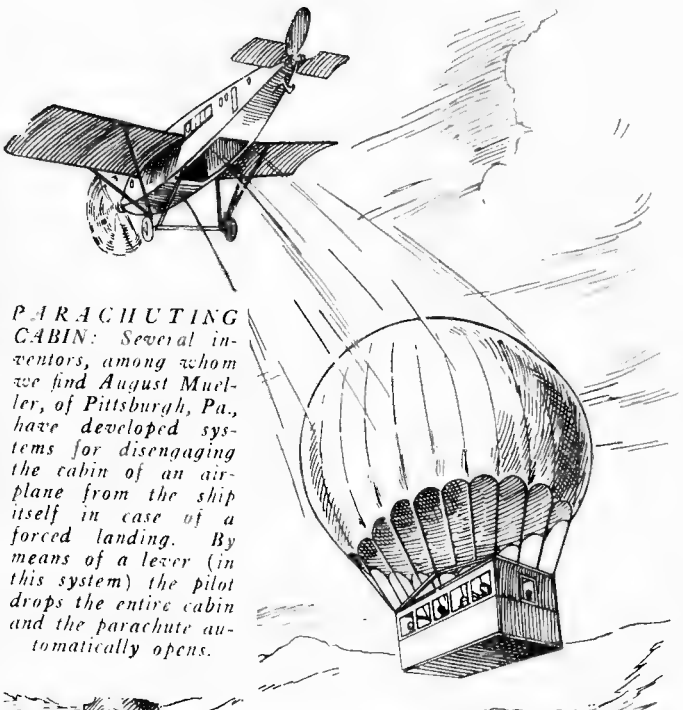
Inventions



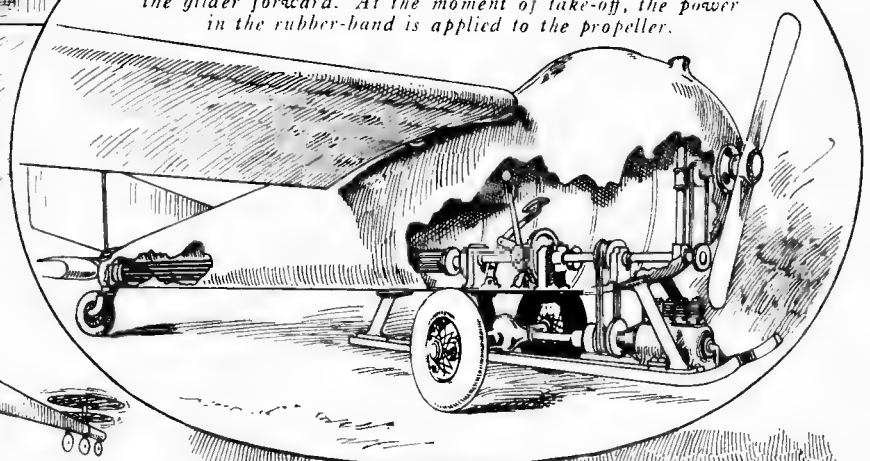
SKY-WRITING has required that the plane move in such a manner as to produce letters horizontally. With a tube having a large number of openings, which openings are controlled by a mechanism within the plane, John T. Remey, of New York, has perfected another system.

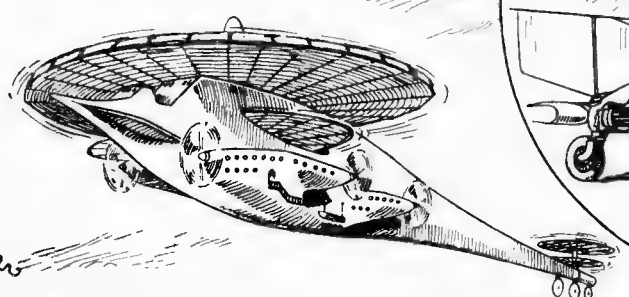


PARACHUTING CABIN: Several inventors, among whom we find August Mueller, of Pittsburgh, Pa., have developed systems for disengaging the cabin of an airplane from the ship itself in case of a forced landing. By means of a lever (in this system) the pilot drops the entire cabin and the parachute automatically opens.

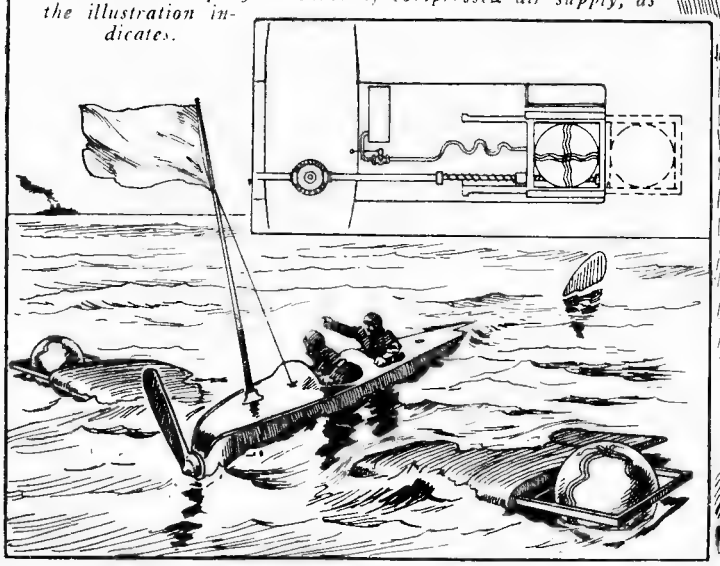
COMBINATION AIRSHIP AND DIRIGIBLE has large rotating disc-like air foils, filled with hot gases; its bird-like body is also so filled. Its inventor is Guido Tallei, of Rome, Italy.

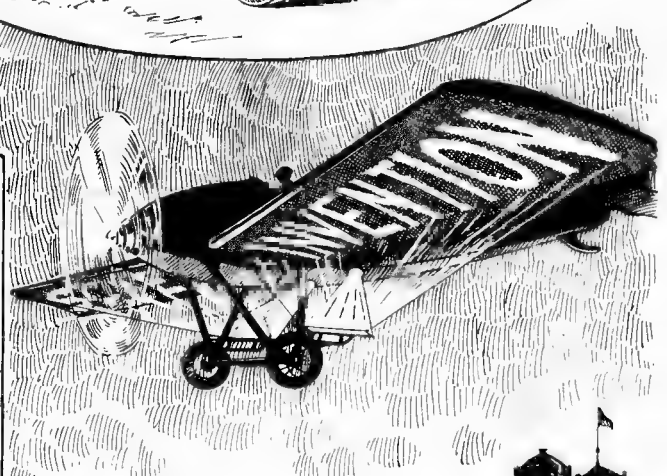
MOTOR-DRIVEN GLIDER of unusual design invented by Carl C. Abel, of Rockford, Ill. A small motor, not powerful enough to lift the plane, winds up, through gears, a heavy rubber-band. The motor, then coupled to the wheels, drives the glider forward. At the moment of take-off, the power in the rubber-band is applied to the propeller.





ANOTHER SAFETY PLANE for oceanic flights, patented by Domenico Pallaria, of London, Ont., Canada, each wing being fitted with a slide, housing an inflatable ball. These can be blown up by a source of compressed air supply, as the illustration indicates.





LIGHTED WINGS: We wonder why this idea was not patented heretofore. Dr. Hugo Junkers, famous German airplane designer, makes the arrangement of two mirrors and two projectors a claim for a patent. The projectors throw a beam of light on mirrors, thence to the under-wing surfaces.

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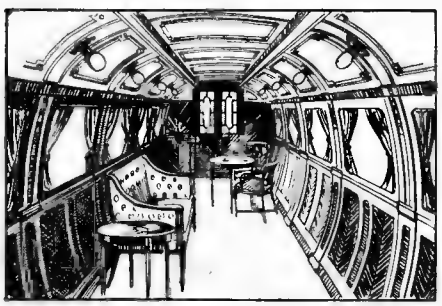
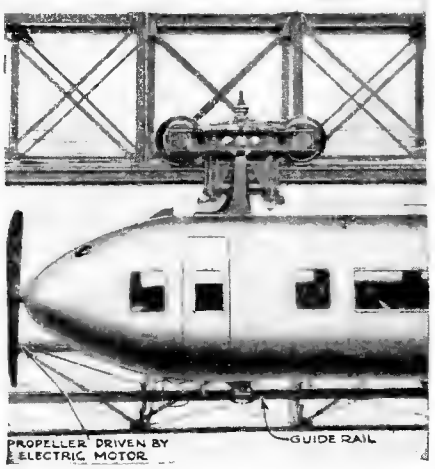
Railway Cars Take Wings



Interior view of the saloon of one of the railplane cars, showing a sumptuousness equal to a transatlantic ship's saloon.

A RAILWAY system with cars that will travel at speeds of 120 miles an hour is now being constructed for test purposes over a tract of the London and North Eastern Railway Company at Milngavie, near Glasgow. The cars of this system will be of light airplane type of construction and will be suspended from single overhead tracks. They will receive their motive power from airplane propellers. The design of the cars may be such that at high speeds they tend to rise slightly in the air, on the principle of an airplane, and thus relieve to a great extent the friction due to the weight of the car.

The overhead tracks are carried on trestles or columns placed at suitable intervals, and a rigid guide rail is provided under each car, to prevent undue swaying of the car. The design of the cars is such that their tendency to rise in the air beyond the amount required to relieve the weight is checked.



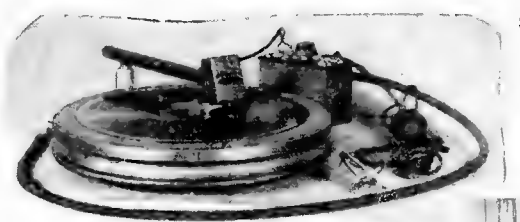
Fresh Sea Air Without a Fan

IN place of fans in the staterooms of the Ile de France, there are ventilating ducts as shown. Fresh cool sea air is distributed from a centralized ventilating system.

The arrow points to the outlet on the wall of the stateroom. The direction of the breeze may be changed by turning the nozzle.

Make Your Home Movies Talk

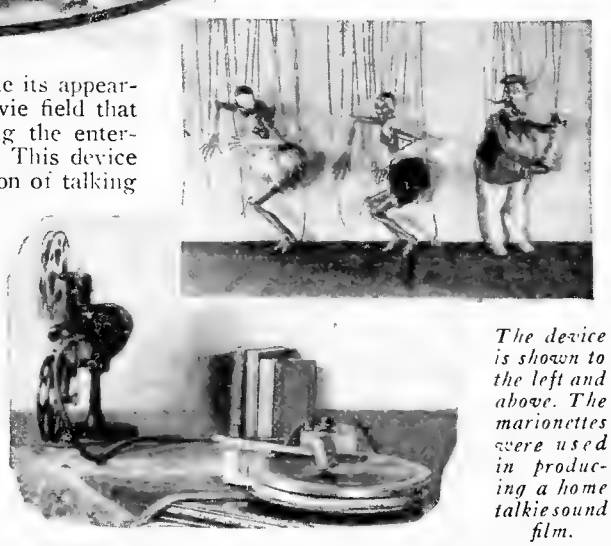
By Don Bennett



A NEW device has made its appearance in the home movie field that gives promise of increasing the entertainment of home movies. This device provides for the reproduction of talking pictures, such as are run in the theatres, in the home through the medium of the home projector, to which it is attached, and the radio set.

The device resembles a phonograph, with its turntable and electric pick-up, but it is connected to the home projector, regardless of type or make, by a flexible shaft and derives its power from the projector motor. It can be used as a phonograph without the pictures, running either kind of record.

The turntable is rotated by a friction wheel which is located under it. The speed is adjusted by sliding the friction wheel radially along its shaft. A gauge is provided so that the wheel may be instantly set to a predetermined position, control being located in a small knob on one edge of the machine.



The device is shown to the left and above. The marionettes were used in producing a home talkie sound film.

The films that are made for use on this new machine are made under the identical conditions by which theatrical talkies are made. All synchronization troubles are overcome in this device.

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Skyhooks for Airplanes

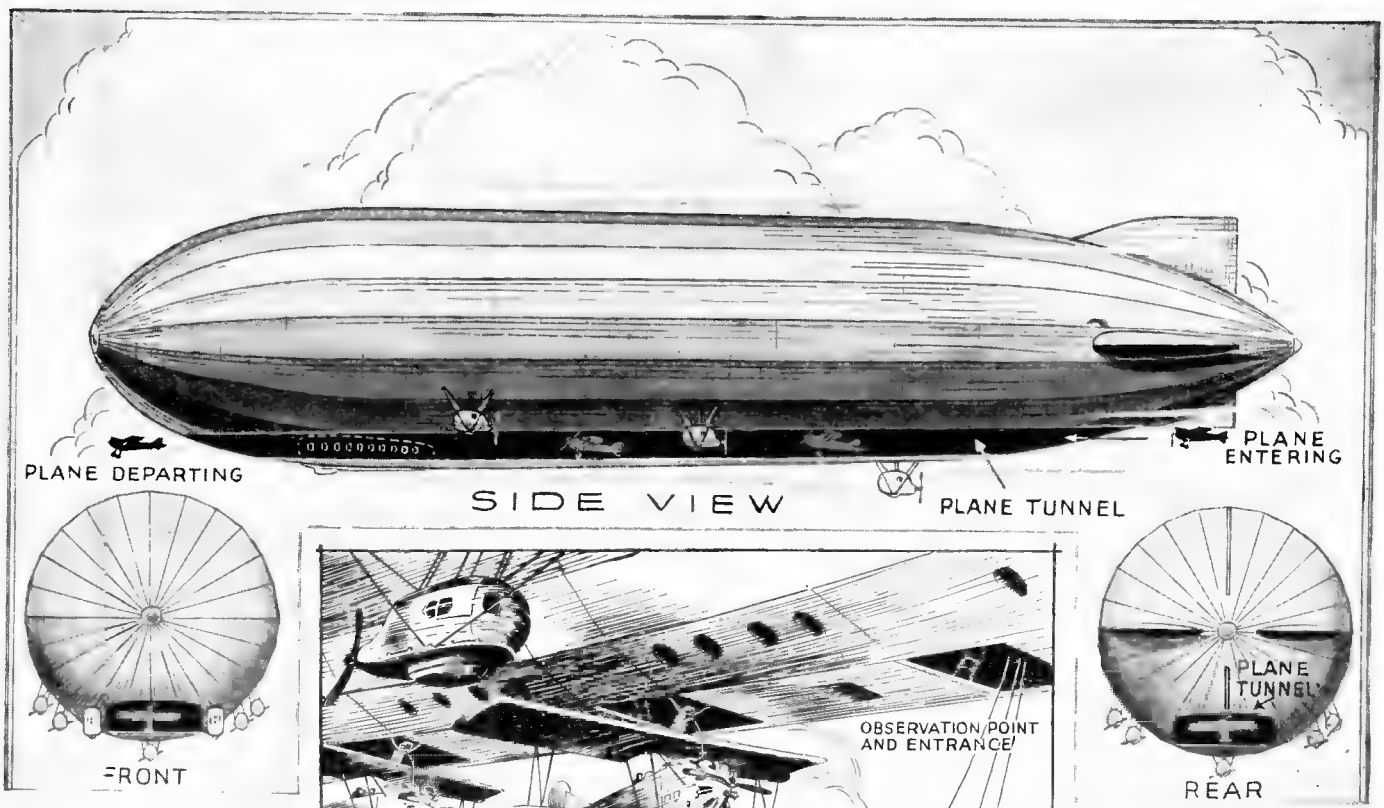
By Botho von Romer

Los Angeles Makes Successful Tests in "Hooking" Planes in Mid-Air

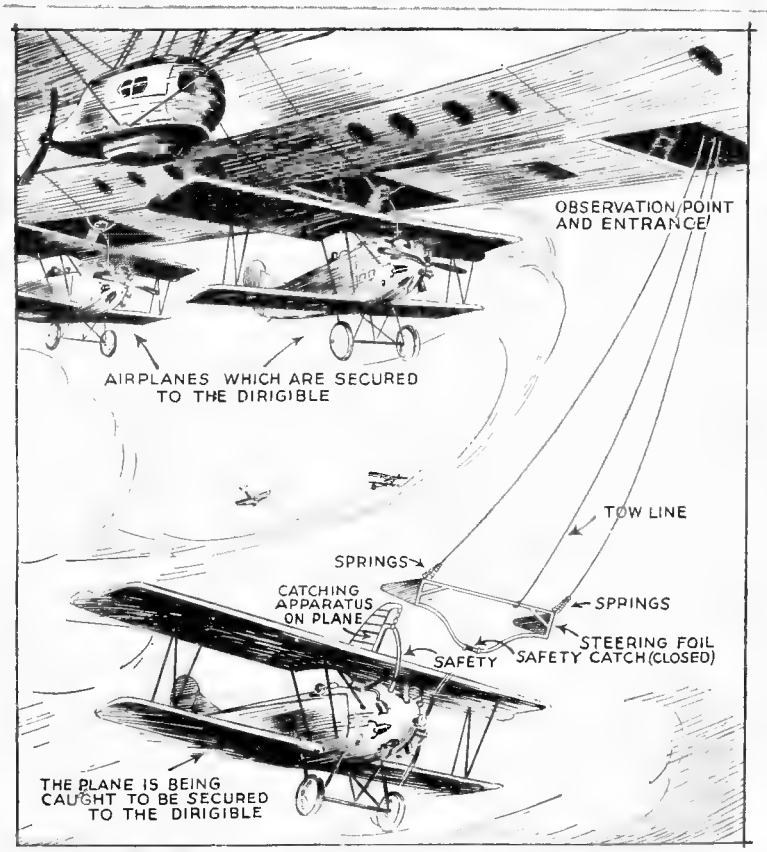
DURING the World War, military officials in Germany made tests with a flying airplane hangar. High speed planes used for delivering important messages were suspended from dirigibles. They were released while the carrier was in midair and in motion. Although these experiments were encouraging, little information regarding them was made public. After the war this problem was taken up in England and first practically carried out with a De Haviland light plane, type 53, and later with a Gloster pursuit plane on the dirigible R-33.

In America we have gone a step further and have been successful in recovering the planes after they have been discharged from the dirigible. The construction of one form of auxiliary apparatus employed in this feat is shown in the drawing appearing on this page. In order for the plane to engage with the dirigible, both must be traveling with the same approximate air speed. The pilot of the plane tries to reach the trapeze grappler, hanging from the dirigible with the grappling apparatus attached to the upper wing of the plane. In a similar way the attached plane is lowered, the motor of the plane is started and, when sufficient speed has been obtained, the plane is released and flies away. The dirigible *Los Angeles* recently carried on several successful tests with a standard size plane of average weight. The plane coupled itself to the dirigible trapeze gear three times, each time disengaging itself, then maneuvering into position and reattaching itself to the mother ship. Naval experts predicted extensive use of this liaison service between dirigible and plane in the future.

Naval and military experts are now considering flying airplane hangars. These are of unusual design and undoubtedly far better than those which make use of a grappling attachment. A tunnel extends along the entire bottom of the dirigible, with an opening at the front and the rear. The tunnel is fitted with a smooth floor, which forms a platform for the landing and take-off of airplanes. The landing plane flies through the rear of the tunnel and emerges from the front when launching. The tunnel provides a place for reserve planes and also holds them while they are being repaired.



Above are a front, rear and side view of the flying airplane hangar. A tunnel is provided along the bottom portion of the dirigible and forms a landing and take-off platform for the airplanes.



The illustration at the right shows how planes are now caught and secured to the dirigible while in midair. In a similar manner, by using the grappling apparatus, planes are launched from the mother ship. The motor on the plane may be started electrically and when sufficient speed has been developed the craft is released.

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MEDIUM-SHIP *the* "SCIENCE" *of* INVENTED "HOKUM!"

In Which a Minister Investigates Spiritualism and Then Suddenly Develops Psychical Powers Which Outclass Those of the Best Mediums

By Herman D. Wagner

My wife took a miniature police camera from her handbag and quickly snapped several large pictures hanging on the walls of the room. She operated in the guise of a saleslady selling a new carpet and rug cleaner. There was not the least suspicion as to her real reason for entering that house. I later used these pictures to produce spirit photographs of the relatives of this home-owner.

WHAT is perhaps one of the greatest of all grafts is the sombre "mediumship" guise, practised extensively in this country and abroad by those who are too lazy to get out and earn an honest living and who prefer to cater to the poor, weak-minded souls in delivering so-called "messages" to them from friends and relatives who have "passed over" to the "other side"; extracting from the poor things their hard-earned dollars in return for a few faked statements such as "We are happy over here," "Would not want to come back to the flesh," "We are with you always," "God bless you," "Everything will come out all right," etc., etc.

Travel east or west, north or south in any country of the globe; pick up a newspaper, theatre-program or special leaflets, and you will undoubtedly see advertisements similar to the following:

DR. "BLANK,"
The Master Mind.

Solves your personal problems, assists happy and speedy marriages, never fails to reunite the separated, lifts you out of the rut and starts you on the road to happiness and prosperity.

Unless he calls you by your full name, you need not pay him one cent of your money.

Another "catch-penny" advertisement reads as follows:

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"In the first place, I have no uncles alive or dead, and in the next place, my name is not Wilkins." So saying, I flashed on the lights and found the medium holding the trumpet to her mouth, which a moment later she tossed into the air. There was great confusion, and the meeting broke up.

After you have seen the rest—
CONSULT THE BEST.
Mlle. So-and-So.

Private readings a specialty. Gives advice on love, health, business, money, and investments. Locates lost articles, missing relatives and buried treasures. Satisfaction guaranteed.

To the average person these seem honest and sincere appeals, and to the person who is enthralled with the mystery of the *occult*, and who spends a great deal of time and money visiting these sharks they appear as "life-savers," but to the true investigator they appear at once as propaganda to rake in the golden eagles.

Not only in magnificently furnished offices do you find these "master minds," but in the towns and hamlets as well, in beautiful private city homes, apartment houses and wayside resorts, posing under the "protection" of a religion, on the platforms, rostrums, theatre stage and what not.

It has been my good fortune to come in personal rapport with many reputed famous and "genuine" mediums, psychics, clairvoyants, and readers in nearly every state in the Union and in several foreign countries. From childhood I have always had a peculiar fascination for visiting fortune-tellers at the fairs, carnivals, seaside resorts, gypsy camps, etc.—and later made it my opportunity to visit well-known mediums in all parts of the world.

At first it was with sincerity, hoping with my visit to each new one of national or international fame to find some spark of genuineness, which I failed to find absolutely and without exception. And then I began to wonder if really there could be a real medium of communication with spirit forces, and if it were possible to foretell future events at all. Then

(*Continued on page 663*)

$21,000.00 for Spirits

For more than six years this publication has offered prizes totaling $21,000.00 for genuine demonstrations and proofs of spirit manifestations which we cannot duplicate by scientific and well-known means.

Up to the present time not one manifestation has been presented which by even the greatest stretch of the imagination could be considered genuine.

How many more years must this prize be offered? Spiritualists, please answer!

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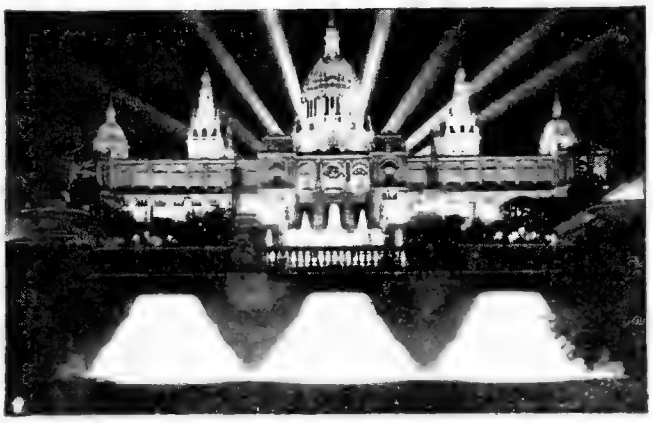
Scientific Progress

In Various Parts of the World Caught by the Camera's Eye



Crown of Lights for Barcelona Palace

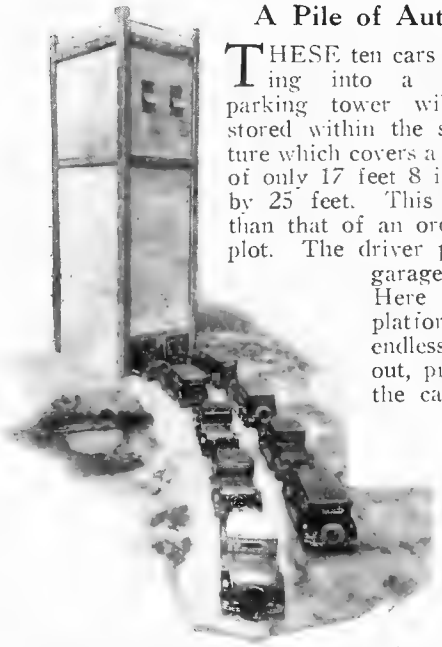
HERE is a picturesque night study of the National Palace at the Barcelona Exposition, Spain. The eight powerful searchlights, visible for miles, crowned the display. Flowing down from the palace at the center are several cascades of water which pour into a great fountain. The fountain throws streams of water 200 feet into the air.

To the Moon by Rocket

IN his experiment to send a rocket to the moon, Dr. Robert H. Goddard, of Clark University, Worcester, Mass., used the transformer here shown for electrically igniting the fuse of the rocket which he intended to send into space, guiding it but a short distance by a special tower built for the purpose.

Rockets do not lose their propelling power in a vacuum, as popularly supposed.

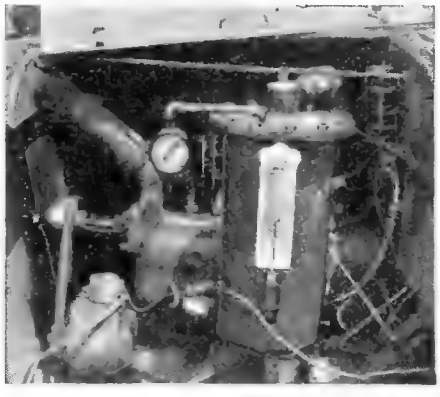
A Pile of Autos



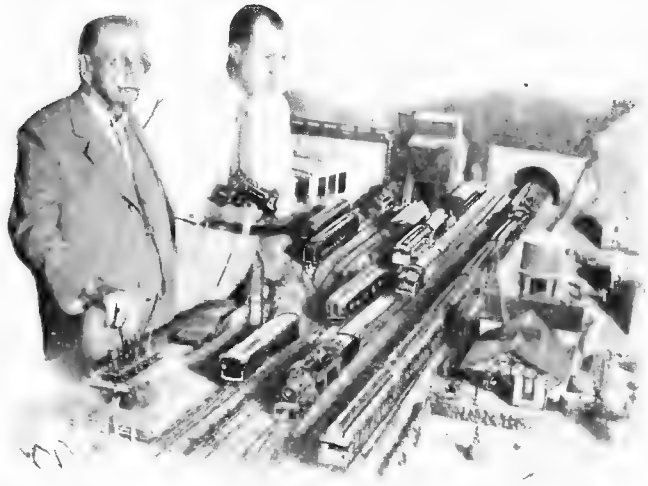
THESE ten cars moving into a novel parking tower will be stored within the structure which covers a space of only 17 feet 8 inches by 25 feet. This space is no larger than that of an ordinary 2-car garage plot. The driver puts the car in the garage on the ground level. Here it rests on a steel platform suspended on endless chains. He gets out, presses a button, and the car moves up as another platform comes in place. This structure has been built at Sandusky, Ohio. The elevators are operated by a 2-horse-power electric motor.

This Engine Uses Crude Oil

THE apparatus beneath the hood of this automobile is a new invention to permit the use of crude oil instead of gasoline for the operation of any internal combustion engine. According to its inventor, D. E. Fowler, of El Paso, Texas, it makes its own gasoline from crude oil.



Meet the President of the Smallest Railroad



WHEN John N. Swartzell, at the right, is not chasing prospective clients or showing apartment houses in the national capital, he is busy building a miniature railroad town. Locomotives and switches are all remotely controlled. Herman Wills is operating the switches.

Drop in Dime! Talking Movies!

WHEN the curtain rises, it displays a glazed glass screen 24 inches wide and 20 inches high. The inventor Robert C. Belgau, Pittsfield, Mass.

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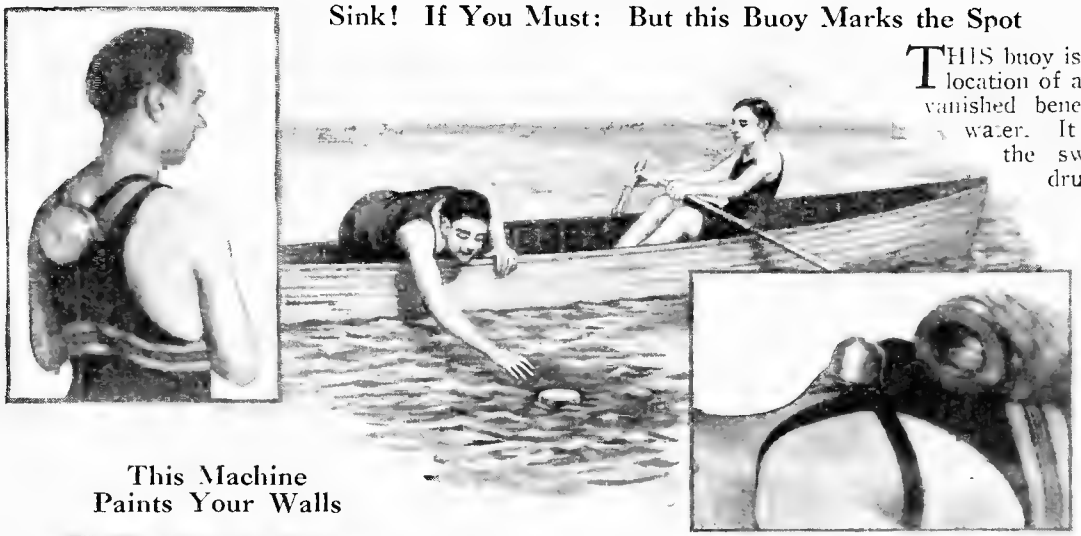
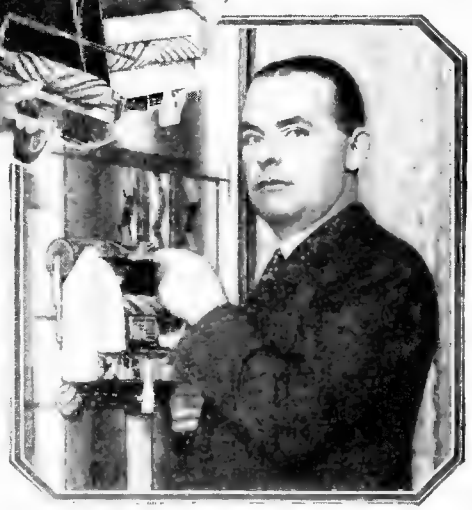
Sink! If You Must: But this Buoy Marks the Spot



THIS buoy is intended to facilitate the location of a swimmer who may have vanished beneath the surface of the water. It attaches to the back of the swimmer and the entire drum holding the reel of cord releases when the swimmer reaches a depth prearranged for by the apparatus. The inventor, William Moore of Seattle, Washington, says that the buoy floats to the surface and unreels a cord which is strong enough to insure one pulling the drowning person to the surface.—*George Solkover.*

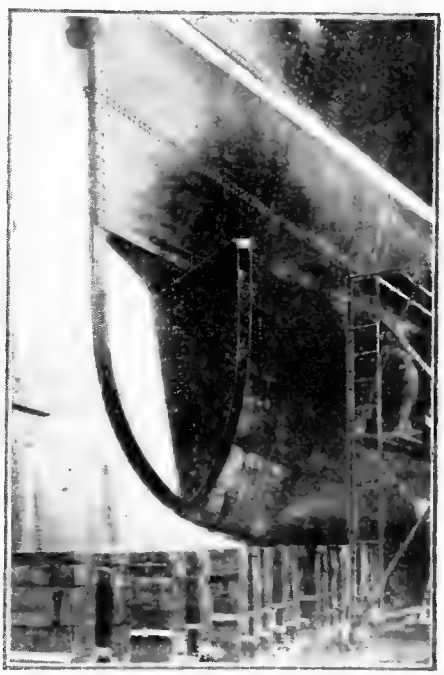
This Machine Paints Your Walls

BARON DEGENHART VON LOE, of Hamburg, Germany, is here shown with his automatic machine to paint any desired artistic design on the walls of a room. It is claimed that an entire room, ordinarily requiring two days to decorate, can be completed in two hours.



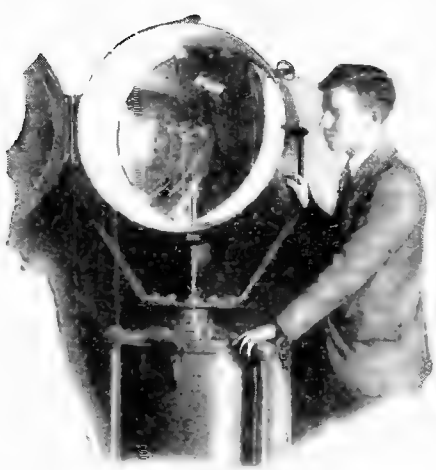
Here Baron Degenhart is shown demonstrating how the rollers of his device are automatically coated and apply the color and decoration to the walls.

Bow Rudder for Narrow Water Waves



THE *Princess Norah*, the latest acquisition of the British coastal steamships of the Canadian Pacific Railway, is equipped with a bow rudder. This is to facilitate the control of the vessels in the narrow channels in Pacific coastal waters and between Vancouver Island, Canada, and the mainland. This photograph of the ship in drydock gives an excellent view of the bow rudder. Note that it is protected from injury by a suitable guard, also serving to strengthen the vessel. On her initial trip a distinguished company of spectators were amazed at the sharp turns the vessel was able to make.

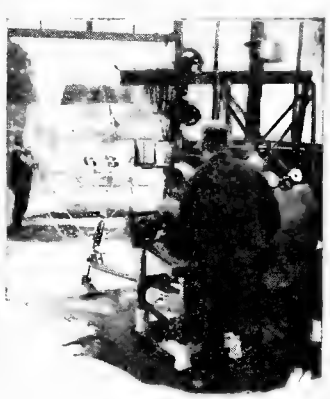
Foggy? This Air Beacon Penetrates It!



HERE is the interior of a new air-field beacon, the rays of which can penetrate through a fog. It was demonstrated at a meeting of the New York Electrical Society, where the spectators could see how the beam of light penetrated a heavy layer of smoke that was set up in front of the light. The device is rugged enough to withstand hard, outdoor usage.

How a Kite Tells the Weather

VARIOUS stations in Europe and America get weather reports with the help of balloons and kites. These are then sent to weather bureaus and the information disseminated to nautical bureaus, airdromes and the like. The kite is hauled in by an electrical winch from an altitude of 20,000 feet. Photos show the kite and the winch.



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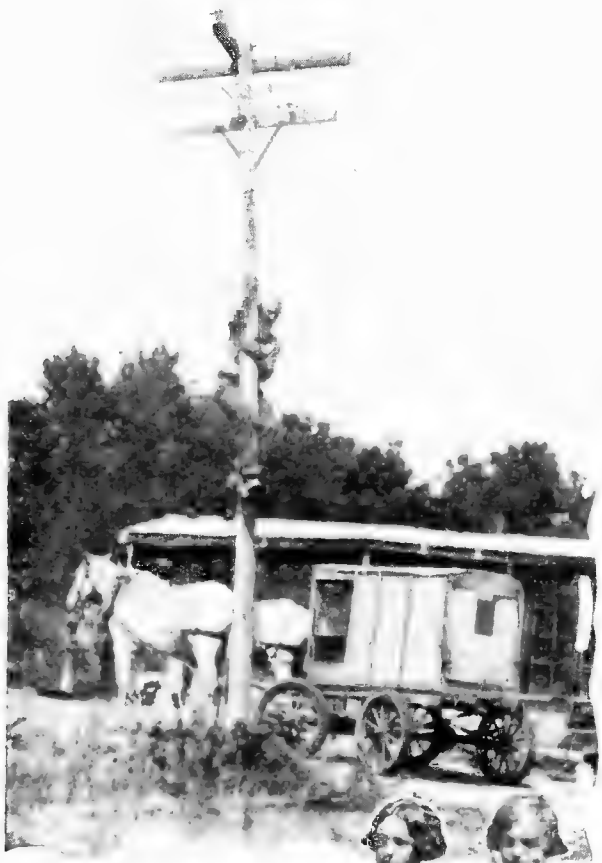
The SMALLEST Telephone EXCHANGE *in this country*

Telephone System for Farmers Has Only 50 Subscribers. Exchange Is Privately Built and Owned

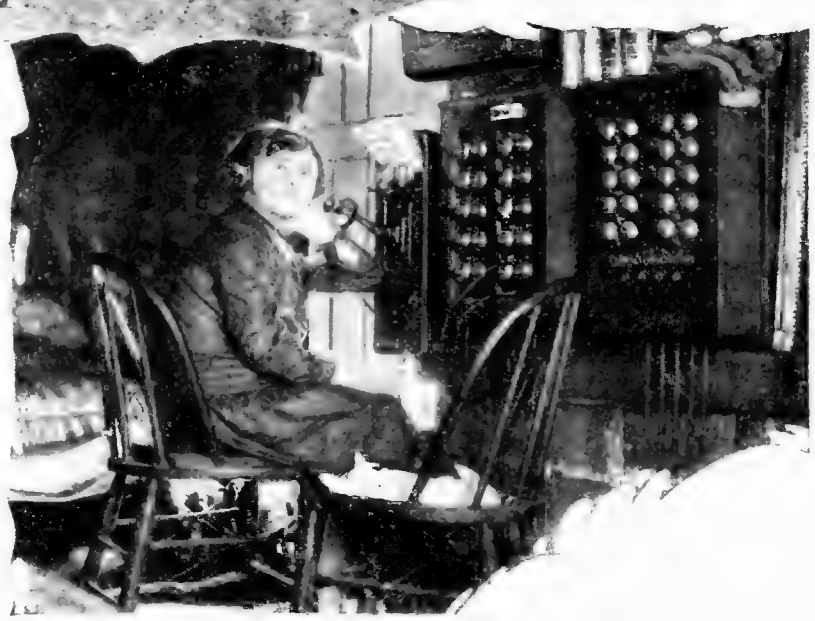
THE smallest independent telephone exchange in the United States was built and is now operated and owned by Mr. Luther Clark, who is 71 years old. This telephone system is used by farmers and ranchers in the middle and western districts of Nebraska, and numbers about 50 subscribers. It is possible for any of the subscribers to communicate with any of the large cities. The charge made for the service is $25.00 a year.

Each member of the family takes turns at operating the central switchboard, and Mr. Clark himself attends to line trouble when necessary. The telephone lines are strung along fences, trees, and sometimes are supported by regular telephone poles. If crops are bad, Clark is lenient with the subscribers, and the telephone bill is cut proportionately. If a death occurs in one of the families, a year's subscription is given free, and when a customer fails to pay a bill, six months' time is allowed to settle the account.



The above photograph shows Mr. Clark making a repair on one of the lines. This system is the only means of communication between farmers and ranchers who live within a radius of 30 miles of the exchange.

The Clark family is shown above. Mr. and Mrs. Clark, together with their two daughters, take turns at operating the prairie telephone exchange. The exchange has been the only means for Clark to make a living for his family.



Communication over the privately owned mid-West telephone system is made possible only through the efforts of the entire Clark family. Line troubles are encountered infrequently and are attended to by Mr. Clark. Each member of the family takes turns at operating the switchboard, and service is maintained at all hours of the day and night. Connection to any place in this country is made possible through the private exchange.

The photograph at the right shows Martha Clark operating the telephone switchboard which is situated in the Clark home. The owner is happy in the knowledge that he has done a valuable service to the community through the installation of the telephone equipment.

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Distorted Perspectives

$5.00 Will Be Paid for Each Picture Accepted and Published

The above was submitted by Edward Raible.

F. P. Cleveland pointed the camera down at the lady.

In relation to the sleigh, the horse appears twice its natural size. Photo by Albert E. Rigberg.

With camera on the ground, S. Yorker obtained this.

A camera placed near the lawnmower is responsible for the above freak picture.

John Steel put subject on a wall and camera on ground.

J. R. Darnall held his camera close to the head of the mule when taking this picture.

Taking this, the camera was placed close to the reclining subject.

The above very unusual photograph of a bison was submitted by N. V. Lyle.

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Would You Believe It?

You Can, When the Stories You Hear Are Photographically Illustrated

Want a Real Teddy Bear?

THE Koala is a native Australian teddy bear. This funny little animal lives a happy, unobtrusive life in a special colony established for the Wild Life Preservation Society of Australia. The Koalas carry their young in a pouch in much the same manner as does the Australian kangaroo. This shows the teddy bear with the head of the young sticking out above the head of its mother. At least you now know that such things as the "teddy" bears, with which children play, have a natural counterpart.

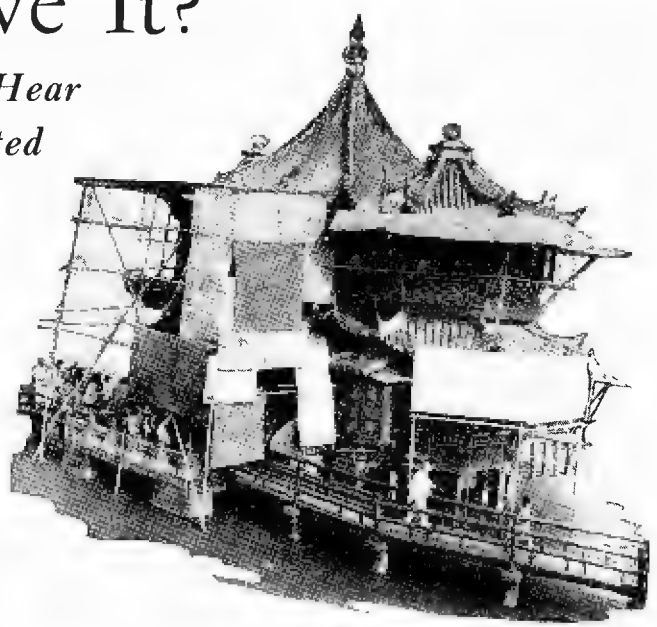


PHOTO EWING GALLOWAY

How Chinese Foil Evil Spirits

THE Willow Pattern Tea House in Shanghai is a novelty to strangers from more viewpoints than one. It is here that the bridges leading to and from the tea house were built very crooked, but there was a definite reason for such construction. The crooked path helps evil spirits lose their way when they try to visit the place. Photo was taken at low tide.

You Can't Sink in This Lake!

PHOTO EWING GALLOWAY

ANYONE will find it easy to swim, even though they may never have been in the water before, if they will make their first try on the American Dead Sea, known as the Great Salt Lake at Utah. Here the water is so charged with salt that the bodies of the bathers are virtually out of the water, and it is almost impossible to drown unless the person almost deliberately attempts to do so by turning over on his chest and lying with his face down in the water. This photograph was taken at Saltair, the lakeside resort for Salt Lake City. It shows how far out of the water are the bodies of swimmers and that even thin persons need exercise no effort to remain afloat.

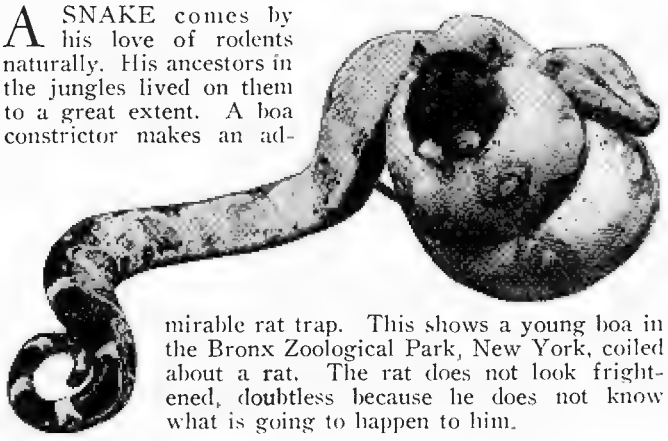
Scaring Hogs in Ceylon

THE contraption here illustrated is the work of a rural mechanical genius in a rice field in Ceylon. A piece of bamboo is mounted on a cross member and the cross member supported on two forked branches. The upper end of the piece of bamboo catches water; the lower end is empty. When the open end fills with water, the tube tilts and the water spills out. This permits the other end to fall back, strike the rock, make a noise, and thus successfully scare away wild hogs.

Ears 47 Inches Long

THESE leaves, also called "ears," belong to the plant popularly known as "elephant ears." One of the leaves is being measured by Pauline Stockton, an instructor in athletics in Los Angeles, for Charles Bowes, the owner of the plant, which he believes developed the largest ears in America. The width of the largest ear was 31 inches, its length 47 inches.

Eliminate Rats With a Boa Constrictor



A SNAKE comes by his love of rodents naturally. His ancestors in the jungles lived on them to a great extent. A boa constrictor makes an admirable rat trap. This shows a young boa in the Bronx Zoological Park, New York, coiled about a rat. The rat does not look frightened, doubtless because he does not know what is going to happen to him.

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Are OIL BURNERS Practical *for the* HOME?

An extra room is available in your cellar, when an oil burner is installed in your furnace. Freedom from ash handling and dust are other advantages.

You Can Judge Intelligently After Reading What an Expert Has to Say

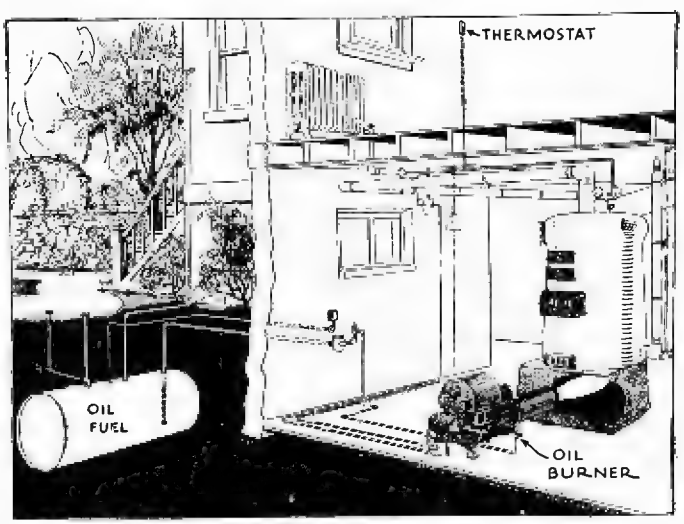
By

Harry F. Tapp, M. E.

SPECIALIST IN OIL BURNER ENGINEERING

HARRY F. TAPP, the engineer who prepared this series of four articles on oil burners for residence heating, is one of the foremost experts on this subject. Mr. Tapp is the author of the "Handbook of Domestic Oil Heating." The principles of various types of oil burners, and the operating cost compared with coal, will be discussed.

THE modern full automatic oil burner for heating homes is a "robot" in the basement that will keep your home comfortable at a healthful, uniform temperature for the entire season, with complete relief from the labor and worry that is directly associated with the annual part-time job of being a furnace man. Yet it is a comparatively simple device. The desired temperature can be obtained by the simple setting of a thermostat located in any room.



Typical oil burner installation (Timken), showing oil fuel storage tank buried in ground, oil burner and thermostat, which automatically controls burner so as to keep house temperature constant.

A full automatic mechanical draft burner consists of a small electric motor which drives an oil pump and a fan, or blower, to provide the oil fuel and air for combustion which is ignited by means of an electric spark, gas pilot or a combination gas-electric pilot. In addition there are the automatic controls used to start and stop. These automatic controls consist essentially of a room thermostat, a boiler or furnace and a burner safety control.

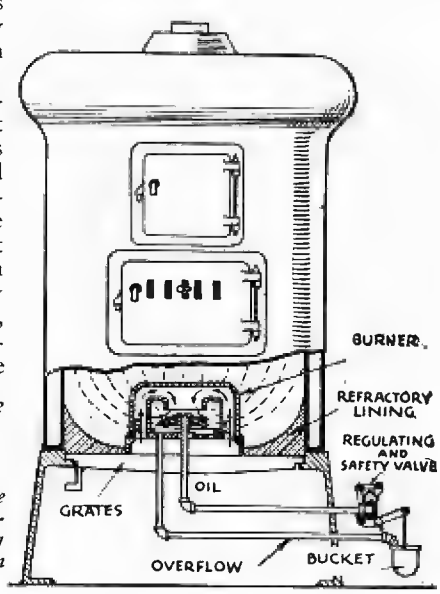
The function of the room thermostat is to indicate and control the burner between the limiting plus or minus two degrees from the desired room temperature. The boiler or furnace control is to prevent overheating of the boiler or furnace and in the case of a steam boiler to prevent abnormal pressures from being developed. The purpose of the burner safety control is to establish a time limit within which the oil must be ignited every time the burner is started, and if the oil is not ignited within the predetermined time, to shut down the burner mechanism. The functions of these three controls are co-ordinated through a master control panel, which may be built integral with the burner unit or may be mounted separately, depending upon the particular choice of the engineer who designed it.

There are several different means employed to accomplish these results, but with the better makes of burners using standard control instruments there is very little to choose from, comparing one with the other. The principal difference is that one system uses 110-volt controls and the other a low voltage, approximately 15 to 20 volts.

The principal major difference in oil burners of various makes and designs is in the method of preparing the oil for combustion. This may be done by either vaporization or atomization.

Vaporization consists of applying heat to the oil while it is in a liquid form and driving off combustible vapors in the same manner that steam is driven from heated water. By vaporizing the fuel, moving mechanical parts can be

(*Continued on page* 638)



Right-hand picture shows a typical, natural draft vaporizing oil burner installed in a residence furnace.

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New Time and Money

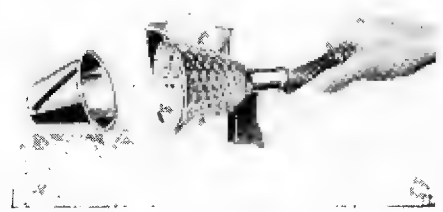
Pea and Bean Sheller

THE article shown here is intended to make it easy to shell green peas and over-ripe green beans. As will be observed, it appears to be a small edition of a clothes wringer, but instead of clothes, green peas are used. The device has two small rubber rollers connected together by means of gears. To one of these gears a handle is fixed. The handle is turned with the right hand and away from the individual using it, or in other words, counter-clockwise, while the left hand inserts the peas. The peas are forced from the pods into a dish and the pods pass on through the rollers. The device clamps to the kitchen table by the usual means.

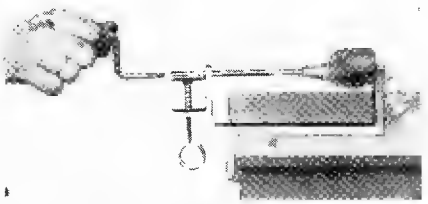
An article that will shell peas and beans in a jiffy.

Food Griscer

FOR the attractive presentation of raw foods such as vegetables, fruits and nuts, this commodity is of great value. There are certain food faddists who would rather eat their foods raw, because in that way they can preserve 100% of the vitamins present. But to make the food appear wholesome and appetizing, it must be cut up. This, the device here illustrated, does very nicely. Not only will it grisce raw foods, but it will also grisce and peel apples and potatoes at the same time. If an apple is cored and quartered and the cored edge is inserted in this appliance toward either grating cone, the peel is left behind. If the vegetable or fruit is inserted in any other way, both skin and pulp is cut up. Two different cutting cones are provided for varying the style of presentation. These are easily interchanged by holding them stationary and turning the handle.



This device will grisce raw vegetables, but is not intended for meat.



A chipper that can be used for potatoes, carrots, turnips, radishes and onions.

Potato Chipper

HERE is a practical household article for making potato chips. It will cut a single potato in one long curl or in semi-circular pieces. The article can also be used for cutting turnips, radishes, carrots and onions. As will be observed, it consists of a thin, steel knife at one end, attached to an upright which is provided with a pin for the potato. There is a long threaded rod with a handle at one end and a sort of chuck at the other. Pulling down on the cam piece releases the threaded rod and permits of instant insertion of the potato. The rod is then pushed forward, locking the potato in place. A few turns of the handle and the job is done. If a half-potato is put in the machine so that the cut extends lengthwise, each turn of the handle will cause a semi-circular slice to be taken off. The potato must then extend far enough beyond the pin, to insure a purchase at this end.

Potato Cutter

An article for making shoe-string potatoes in one operation.

THE man who fancies potatoes likes nothing better than shoe-string potatoes, but the mistress of the house does not always care to fuss with slicing great quantities in the usual way. The work is tiresome and the potatoes themselves do not always come out as anticipated. To facilitate the work, this simple device will shoe-string a whole potato in less time than it takes to peel it. As will be observed, the article consists of a number of steel knives at right angles to each other, mounted in a frame. When the frame is pressed down on the potato, the entire potato is evenly sliced in square slivers.

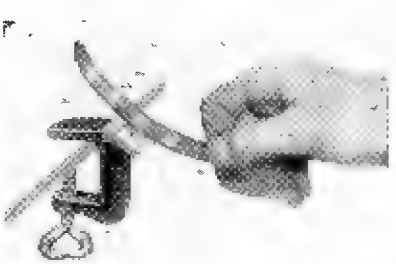
Can Opener

MUCH of the cooking today consists of delicatessen commodities which more often than not are far more appetizing and much more tender than the same food prepared at home. The reason for this is quite obvious when one realizes that food packers have saved no expense, time or trouble in perfecting their canning systems to such an extent that the freshly plucked material is put up in the cans in much less time than it often takes for the same material to be shipped to the market and sold by retail dealers. Consequently, a tool to remove the top of cans quickly and leave no sharp edges invariably meets with favor. The one shown below does this. The can is gripped when the handles are pressed together, and a few turns of the crank severs the top.

A turn of the crank handle and the top is no longer on the can.

Bean Stringer

STRINGING beans is not very difficult, but it is a tedious, tiresome job. Then again, one does not always get rid of all of the strings. They frequently break off and after the beans are boiled the housewife finds the dish full of strings just when she was trying to make an impression on hubby's boss, who had been invited to partake of a real home-cooked meal. But the inventors again come to our assistance by presenting us with this interesting bean stringer. A razor-edged blade projects but slightly above the opening in the top of the device and the bean is merely slid along the surface, whereupon the string is sliced off. The string is here shown on the knife.



This bean stringer reduces the length of time for such an operation.

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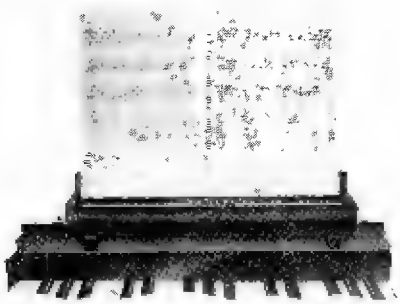
Savers

By Joseph H. Kraus



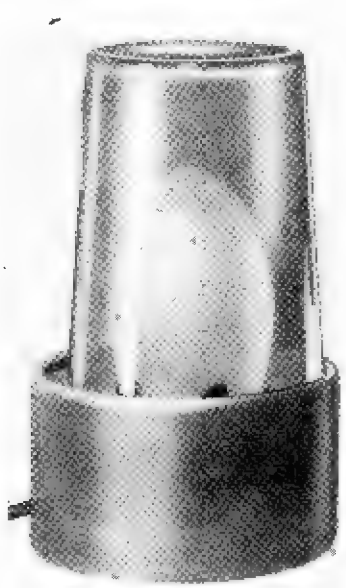
This piano light illuminates a sheet of music from below.

Piano Light

THE greatest difficulty with lights for the piano is that they either throw the light directly into the eyes of the player, or else throw the light down upon the keys of the piano, and the glare reflects to the player's eyes. In order to obviate this difficulty, an enterprising manufacturer has developed a piano light which casts its rays up from the bottom on the sheet of music. It is claimed that an even diffusion of light is produced, and that the glare is completely eliminated. The article clamps directly to the music rack of the piano.

Steam Egg Cooker

THIS electrical contrivance has a clamp for holding an egg in an upright position as indicated. A teaspoonful of water is poured into the interior which automatically turns on the current, provided that the device is connected to some source of potential. A glass is inverted over the egg, which a few minutes later is found to be cooked by steam.



This steam egg cooker is electrically operated. Current turns off automatically.

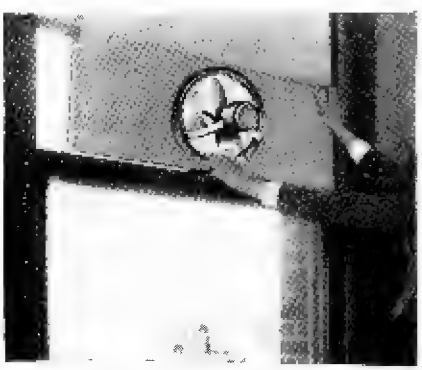
Combination Washing Machine and Ironer

THE two photographs here illustrate a new departure in washing-machine construction. This consists of a removable wringer and in place of the wringer, an ironing attachment can be added. The change requires but a moment to become effective. The entire wringer head is lifted and the ironing head is substituted, when required. When the wringer is not being used, it is placed in the washing machine itself or in some out of the way nook. The apparatus is mounted on rollers so that it can easily be moved from place to place. There is little doubt but that it fills a long-felt want.

The attempt on the part of some manufacturers to unify appliances for the home and to make devices with interchangeable parts so that they can be used for a multiplicity of purposes, is highly commendable. But even this on occasion may go a bit too far, because it is sometimes just as difficult to substitute an attachment for one already in place on the machine, as it would be to use another and separate device. In this case we see a step in the right direction. There is no difficulty in interchanging the wringer and the ironer.

This washing machine can be instantly changed into an ironing machine by substituting the ironing attachment for the wringer.

A Cool, Well-Ventilated Kitchen



A fan that blows hot air out of and cool air into the kitchen.

ONE does not often care to have an apartment filled with odors developed in a kitchen, nor does the housewife, who is in the kitchen, enjoy the heat while the stove is operating at full blast. It is true, of course, that some of our modern gas stoves have insulated walls to prevent the dissemination of much of this heat. But even then, both heat and odors will arise constantly and make the kitchen a place of drudgery. For comfort, for good ventilation, and for cooling the kitchen, we can use an electric fan mounted in a suitable holder and adjustable for the average window. The article can be plugged directly into any convenient outlet socket. A pull-chain attached to a tumbler switch starts the fan. The blades of this are so arranged that a double stream of air is produced, one entering the kitchen, and a second exhausting therefrom.

Such a device is almost indispensable in small kitchens and in modern apartments with kitchenettes.

Hand-Operated Clothes Washer

FOR washing baby's clothes we find a device on the American market which does the work effectively and quickly and the commodity is well within the price of the average pocket-book. As will be seen, it consists of a nickel-plated bell attached to the bottom of a nickel-plated tube. In the top of this tube there is a valve. The action is as follows: When the bell is pushed down upon the clothes, air is expressed and a partial vacuum is formed, causing the clothes to be lifted up during the up movement of the appliance. Thus, by rapid motions up and down, the clothes are quickly and thoroughly washed. The appliance prevents soiling hands and also will keep the hands dry during practically all of the operation except wringing and hanging the clothes to dry.

Here is a clothes washer operating on the vacuum principle.

Names of manufacturers furnished upon request

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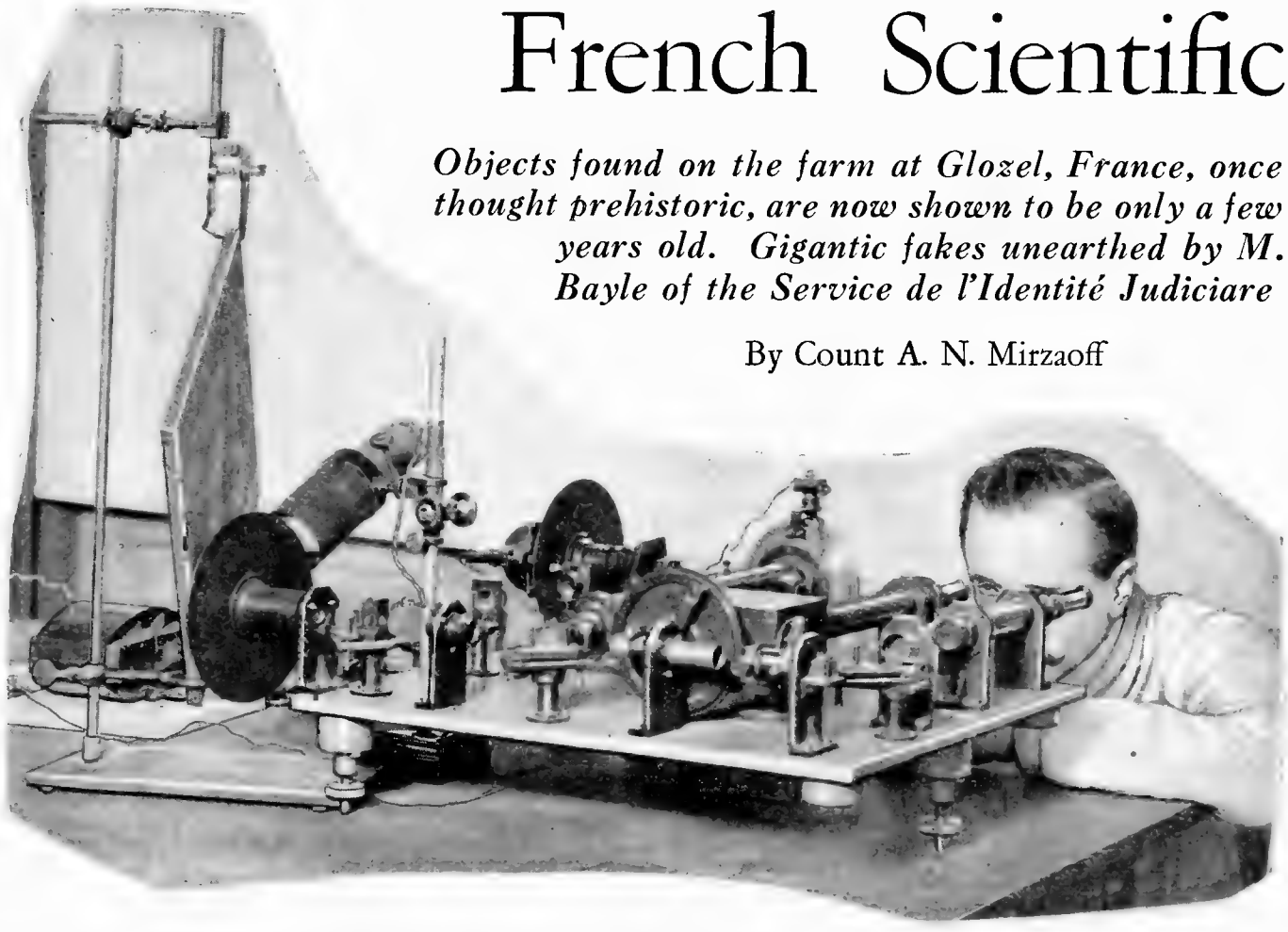
French Scientific

Objects found on the farm at Glozel, France, once thought prehistoric, are now shown to be only a few years old. Gigantic fakes unearthed by M. Bayle of the Service de l'Identité Judiciare

By Count A. N. Mirzaoff



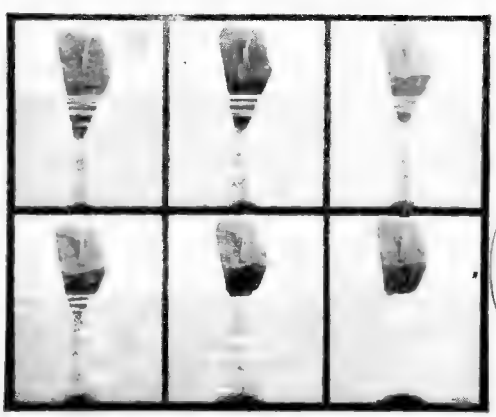
The spectrophotometer being used by M. Bayle for determining the degree of chlorophyle absorption by various plants taken out of the Glozel tablets.

ONCE more science has come forward to the rescue of a great scientific problem, and with mathematical accuracy has exposed one of the most gigantic fakes ever recorded in the annals of archeology. The controversy which has been raging, since 1926, over the supposed prehistoric antiquity of the objects discovered a few years ago on a farm at Glozel, France, has been finally settled, thanks to modern mechanical processes of investigation.

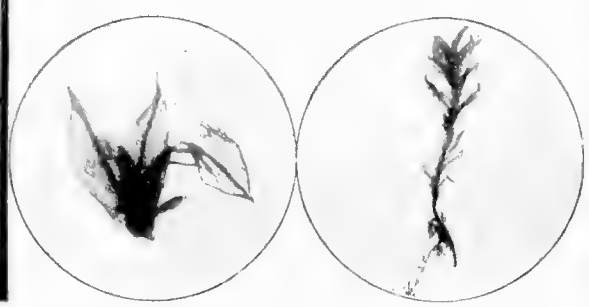
A few years ago a pleasant looking French peasant boy named Emil Fradin, while plowing on a hillside on a farm at Glozel near Vichy, suddenly came across some stones and bricks bearing curious hieroglyphic writings. His curiosity aroused he notified the local authorities; soon there was a mob of scientists and prospectors, armed with picks and shovels, digging furiously at this "prehistoric" spot.

Altogether the farm yielded some 3500 odd objects consisting of pottery, glass, arrowheads, and many small clay tablets. These were placed in show cases in an improvised museum in one of the Fradin's barns. However, the authenticity of this great discovery was not to be left unchallenged; for, soon after the excitement was over, there arose a heated argument among French scientific societies. The savants of the Ministry of Fine Arts and of the Institute de France were divided on the question of whether the objects were actually relics of an extremely remote period of civilization, or merely modern objects, purposely planted in the place to defraud archeologists. The contro-

How science finally determined the age of the Glozelian relics is shown here in diagram and photographs.



A strong bit of evidence. A portion of a Glozel tablet disintegrating in water. Photos taken at intervals of twenty seconds. Note progress.



Microphotograph of a small tuft of moss and a vegetable showing recent life. These fragments were taken out of so-called antiques.

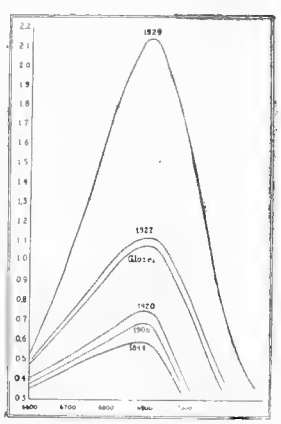


Chart showing chlorophyle absorption of plants at various ages.

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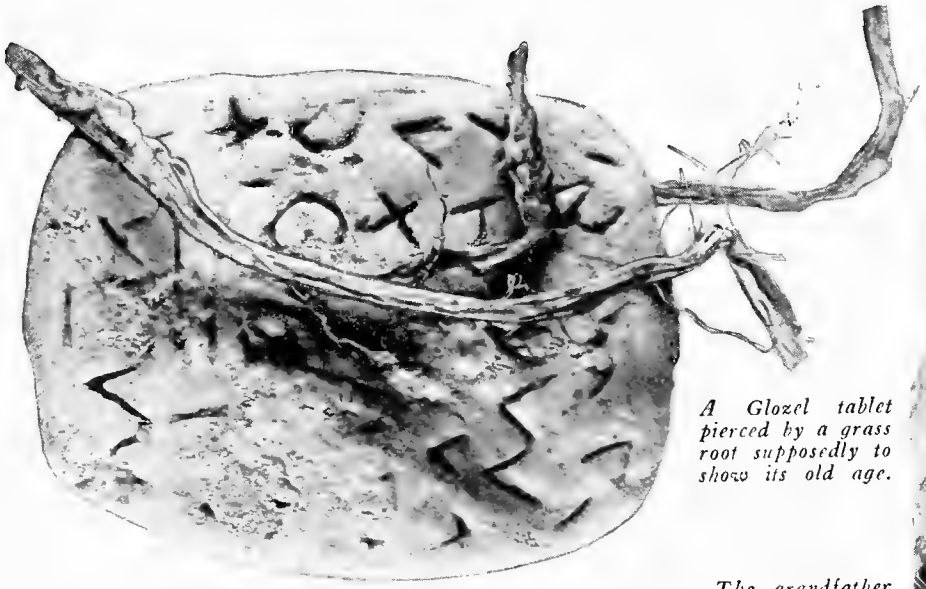
Sleuth Exposes *Glozel* Fraud



A Glozel tablet pierced by a grass root supposedly to show its old age.

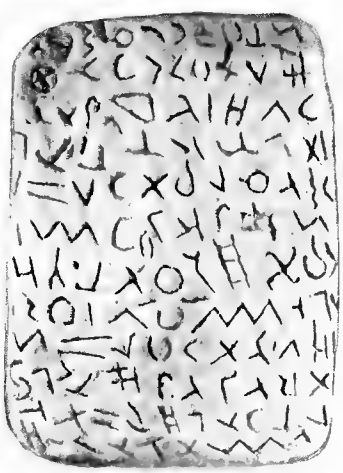
The grandfather of Emil Fradin also implicated in faking the Glozelian tablets. He is standing in front of the barn, transformed into a temporary museum which contains about 3,500 odd pieces.

versy grew so hot, that the group of scientists divided into two opposing camps. Prof. Rene Dussaud, curator of the Louvre, championed the argument of his colleagues, the anti-Glozelians. Dr. Salomon Reinach of the Institute de France with Prof. Joseph Loth of the Collége de France became the leaders of the pro-Glozelian group. The former insisted that the objects were new and probably fabricated by the Fradins and buried in their farm. While on the other hand the latter group maintained that they were genuine, belonging to an unknown age. The matter finally was brought before the French Tribunal. Puzzled at how to settle this delicate argument, the French Tribunal decided to assign the job of passing the Solomonic judgment to M. Bayle, police identification expert, of making a thorough scientific investigation of the whole subject.

M. Bayle is well known for his previous work of identification in connection with the detection of crimes and frauds. His work with the Paris judiciary police has been of exceptional help in solving some of the most baffling criminal cases, and especially in the detection of spurious paintings, which have been palmed off by unscrupulous dealers on rich collectors and on museums.

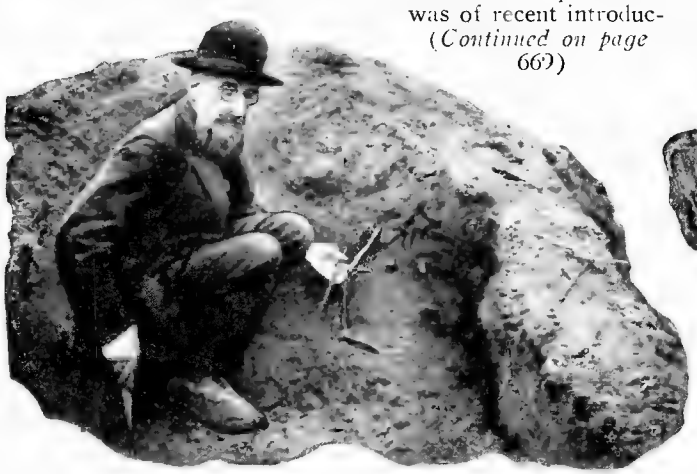
M. Bayle spent a whole year in making thousands of experiments, before he was able to give a final verdict for this greatest of all frauds in the history of archeology. Thus, in a few words he says "that the inscribed tablets were not more than five years old, and that some of them had been in the earth only a short time." After the analysis, M. Bayle arrived at the following conclusions. 1—That chlorophyllous vegetable substance existed in several of the so-called "Glozelian bricks" which showed that plant life was of recent introduc-

(*Continued on page 669*)



One of the Glozelian tablets over which there was so much controversy as to its authenticity. This contains traces of grasses which spectroscopic analysis proves are no older than the year 1920.

Objects seized in the Glozel museum were boxed and sealed by the governmental authorities.



Examining a fragment of root taken out of the soil in which the tablets were buried. Photo shows Professor Audollent, one of the members of the French Society of Antiquity.

Photo shows a part of a fragment taken from the Glozel site near the city of Nantes. This shows traces of cloth having been applied to it. The cloth is of recent weave and machine woven. This was another damaging bit of testimony. All of the evidence had to be so specific that there could be no dispute as to the inferences drawn. Even pro-Glozelians had to be convinced.

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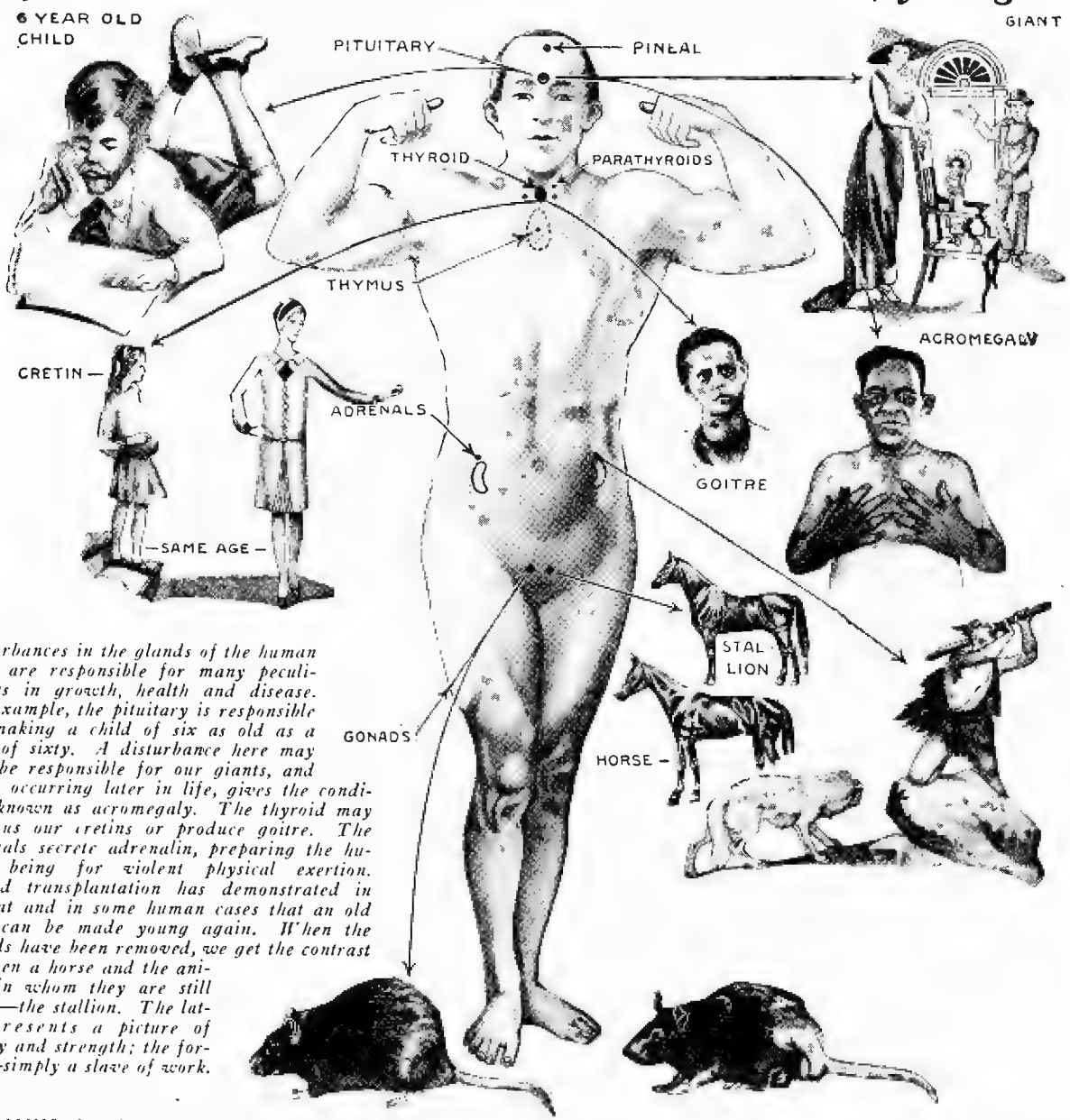
GLANDS—*Monkey and Other Kinds*

By Dr. G. H. Estabrooks
Colgate University

Do you know that Giants, Dwarfs and Premature Old Age are all caused by faulty gland activity? And that your health, and even your moods, are reflections of the conditions of your glands?



Disturbances in the glands of the human body are responsible for many peculiarities in growth, health and disease. For example, the pituitary is responsible for making a child of six as old as a man of sixty. A disturbance here may also be responsible for our giants, and when occurring later in life, gives the condition known as acromegaly. The thyroid may give us our cretins or produce goitre. The adrenals secrete adrenalin, preparing the human being for violent physical exertion. Gonad transplantation has demonstrated in the rat and in some human cases that an old man can be made young again. When the gonads have been removed, we get the contrast between a horse and the animal in whom they are still intact—the stallion. The latter presents a picture of beauty and strength; the former—simply a slave of work.

WHEN the thirsty American citizen established the institution of home-brew, he probably looked on it as a novel idea. Actually nature had beaten him to it by several millions of years, for in every animal and especially in the human being there are a number of little distilleries. These brew a line of stimulants, compared with which the most potent product of the amateur drink producer is a very poor and weak article.

These little stills within the human body are called the ductless glands and they are very important indeed to its proper running. They give off substances which act in much the same manner as very powerful drugs, and woe betide the individual in whom one or more of these little glands get out of order. The results run everywhere from feeble-mindedness and insanity to actual death. Only very slowly are we learning their true function and the story of their work is a truly fascinating one.

The Thyroid Gland

IN your throat and in front of your windpipe is a very important body, the thyroid gland. It is this which becomes enlarged in the case of goitre. It gives off a substance called thyroxin, which is absolutely necessary to a healthy body. For instance, every now and then a child is born without a thyroid gland or *(Continued on page 652)*

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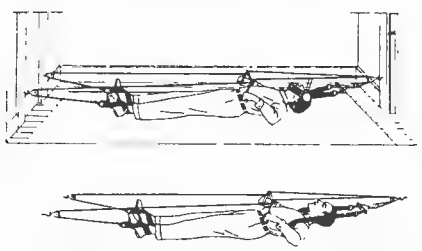
Peculiar Ideas Inventors Patent

How Many of Them Are Impractical?

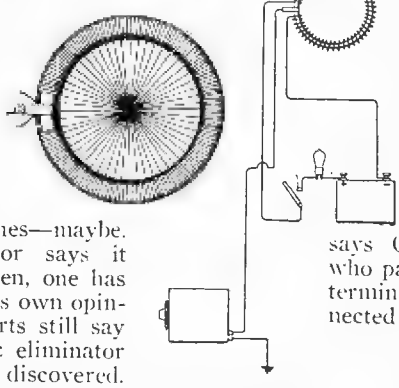
Makes You Taller?



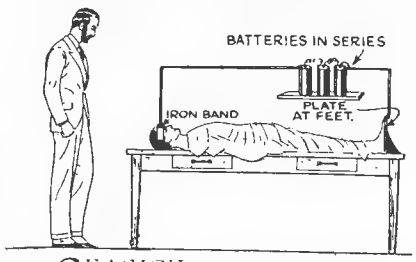
ONCE upon a time there was a man upon whom all of the people looked down. It reads like a fairy tale, doesn't it—but it is true. This man conceived the idea of making people look up to him, so he built a body stretcher and sold it through the U. S. mails. The body stretcher was intended to increase a person's height by inches. The postal authorities stamped the device as fraudulent and closed the mails to Mr. Glover. This body stretcher, invented by George Dobbins of Berkeley, California, is used in the "science or theory of tension therapy for health-giving purposes"—whatever that may be.

Eliminate That Static!?

ARE you troubled with static and fading? Just install this device, invented by George William Cooper of West Harwich, Mass., and the static will continue to roll right in. The ring of magnetic material to which a wire from the radio set is connected is wound with a coil of wire, connected to a source of current from a battery. A couple of permanent magnets and the static vanishes—maybe. The inventor says it does, but then, one has a right to his own opinions. Experts still say that a static eliminator has not been discovered.

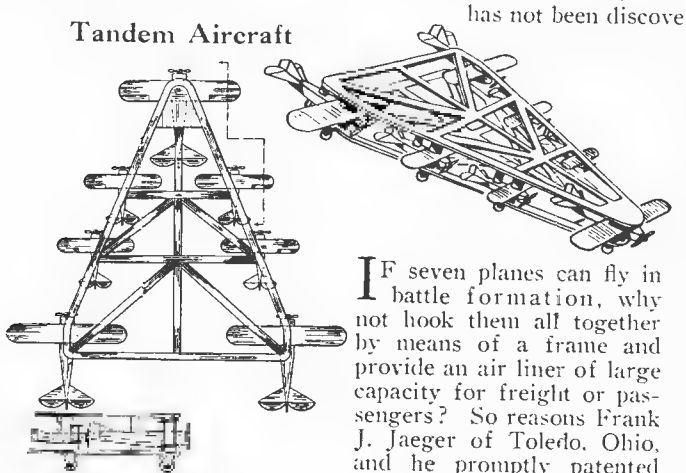


No More Seasickness!



SEASICK—nauseous—constipated—pfuff. A couple of dry batteries, an iron band and a plate, the former connected to the head, the latter to the feet, and the current courses through the body, "normalizing the polarity of certain extremities of the nervous system which have been so affected as to bring about a reversal of the normal action of organs controlled thereby." So says George Fabyan of Geneva, Ill., who patented the system. The negative terminal of the batteries must be connected to the feet!

Tandem Aircraft

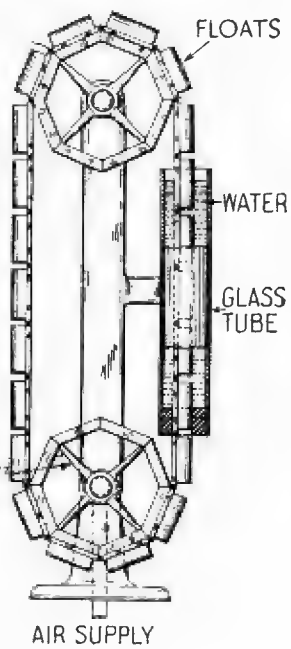


IF seven planes can fly in battle formation, why not hook them all together by means of a frame and provide an air liner of large capacity for freight or passengers? So reasons Frank J. Jaeger of Toledo, Ohio, and he promptly patented the suggestion. If you ever see this "gang" of planes in flight, you will know who is responsible for the idea.

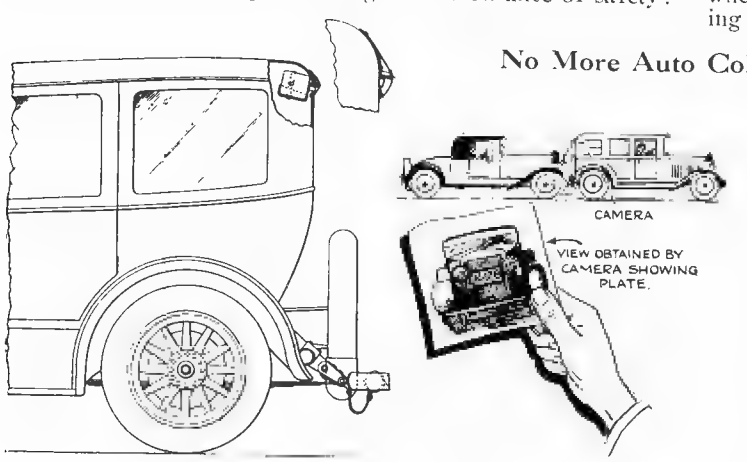
We wonder if it would not be just as cheap to build a large plane, capable of doing everything that this plane can do, at even a lesser expense and greater assurance of safety!

Perpetual Motion at Last!!

THE age-old problem has been solved! The U. S. Patent Office will not issue a patent on a perpetual motion machine, unless a working model is submitted. Here at last is a perpetual-motion machine that motes. As will be seen, it is an endless chain made up of floats, on one side of which the floats pass through a glass tube of water. Here "there is an urge for the float in the tube to rise." However, Mr. Frank Tatay of New York, who patented this invention as a window display, has made provision for urging the floats to rise, *by supplying a source of compressed air supply*, exhausting through nozzles in the wheel spokes and by reaction driving the mechanism. That lets him out.



No More Auto Collisions! Or This Camera Will Snap You



BAM! "Someone crashed into the rear of this car," exclaims the passenger. "Don't worry about it," says the owner, "I've already photographed him." And so he has, by gum! Arranged in the rear of the car, a camera is suitably mounted. This camera releases its shutter at the moment of collision. At night time a flashlight also goes off. What happens if the offending driver backs up and gets away is not explained. It is obvious that from the position of the camera it is quite impossible to take a photo of the license plate and the tops of many cars look alike. Will this device tell who was at fault, even if a very clear photograph of the smashup is taken? May not the shutter operate too quickly to show, in the photograph, the extent of the injuries sustained? This device is the invention of Thomas Taylor of Chicago, Ill.

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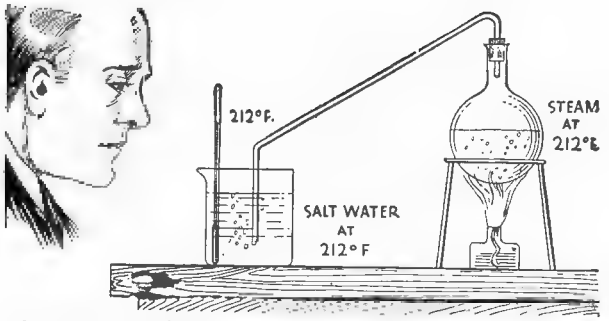
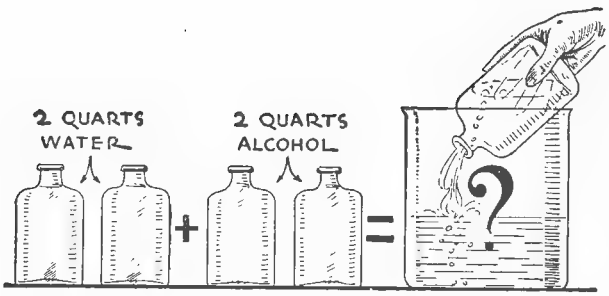


The apparatus is set up as shown above. Any change in temperature in the salt water will be noted on the thermometer.



Two quarts of alcohol and two quarts of water are here shown, arranged to test whether the expression "two and two make four" is true. Just what quantity do you obtain in the last vessel?

Can you Solve *these* Scientific Puzzles?

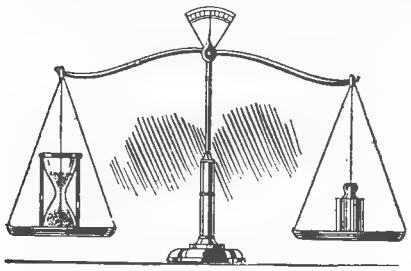
By Ernest K. Chapin, M.A.

Steam and Salt Water

SET up apparatus as shown in the diagram. The temperature of the water will not rise above 212 degrees Fahrenheit and steam at the same temperature will pass into the salt water. Will the temperature of the salt water, which has been previously heated to 212 degrees F., change, and if so, how and why?

The Weight of an Hour Glass

AN hour glass is balanced on a sensitive scale, as shown. When the particles of sand are suspended in the air, they should subtract from the aggregate weight of the hour glass. Will the hour glass weigh the same when the sand is flowing as it does when the sand is not flowing?

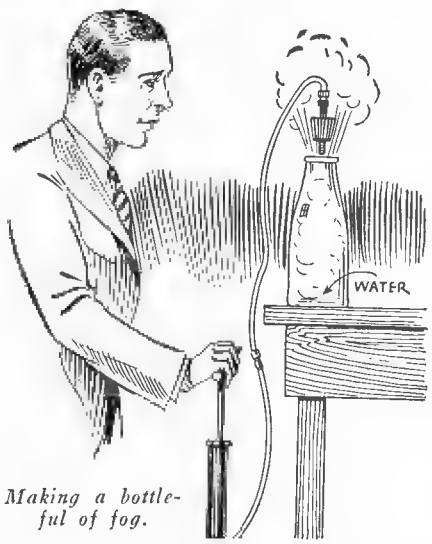


The hour glass is carefully balanced on the scale and then turned over to permit the sand to run.

Fanning a Thermometer

WE all use fans to cool ourselves off when we are hot, and they work quite well. If you fan a thermometer, will its reading change?

Fanning a thermometer to see whether there is any change in temperature.



Making a bottleful of fog.

A Bottleful of Fog

AIR is pumped from a regular air pump into a bottle containing a little water. The pressure is increased until the stopper blows out. Why does the bottle become filled with a thick fog?

Can You Sing Chords?

CAN a person sing several different notes at the same time, that is, can he sing a chord—or does he sing a pure note of but one frequency?

Is the singer shown in the picture singing notes of one frequency or are the notes he is singing of several frequencies?

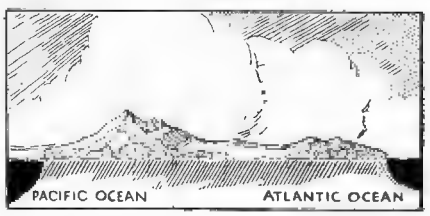
See page 650 for answers to these puzzles.

Do Two and Two Make Four?

FROM our earliest recollections, we have always been taught that two and two made four until it became a matter of blind faith. But do two and two always make four? Carefully measure two quarts of water and two quarts of alcohol. Mix the water with the alcohol and what have you?

Is the Sea Level?

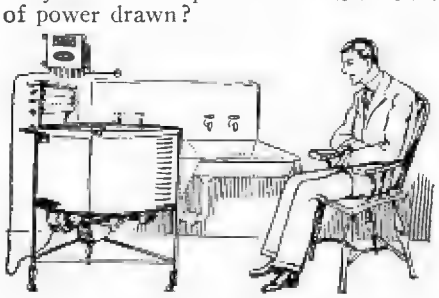
SCIENTIFIC experiments have shown that water seeks its own level. It is impossible to conceive, therefore, of a continuous body of water that is not level. All the oceans are connected together at some point on the earth, so we may refer to them as continuous bodies of water. Is the sea level along the Pacific coast the same as that along the Atlantic coast in the same latitude?



Is this picture showing a cross-section of the land between the two oceans and the ocean levels drawn correctly?

When Does Motor Take Most Current?

WHEN does a washing machine draw more power, when it is running fast or when it is running slowly? Why should the speed affect the amount of power drawn?



The man is shown watching the meter as the speed of the motor varies. What does he learn from these observations?

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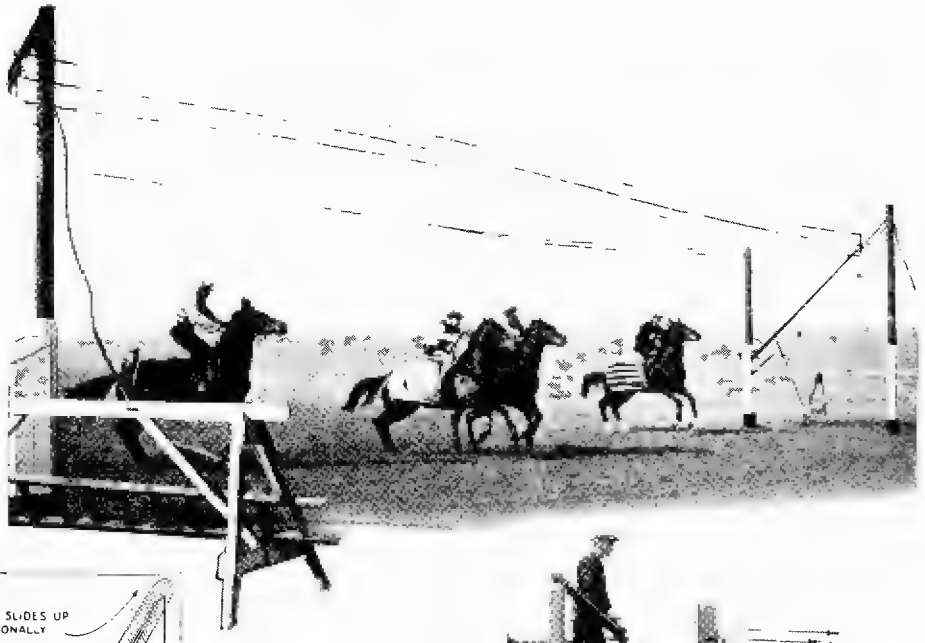
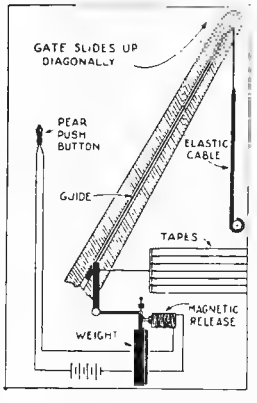
They're Off

To a Perfect Start

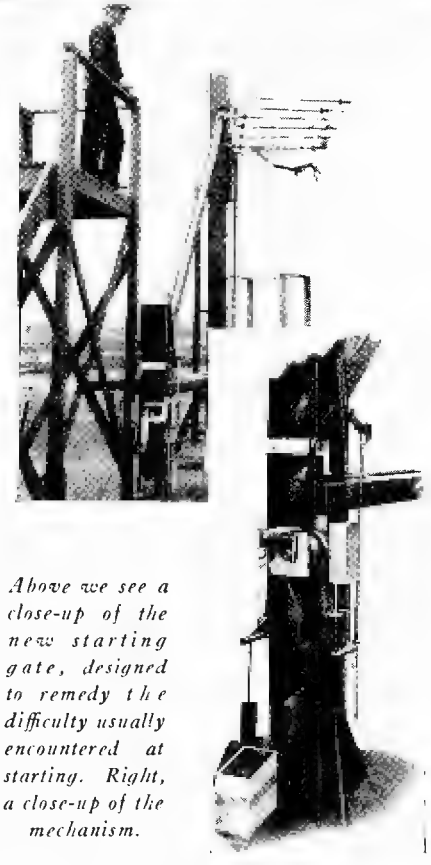
New Systems for Aiding the Start, Photographing the Finish and Recording Horse's Heart-Beats



INTO what fields of sport and effort won't science enter? It comes even to the aid of those who are interested in the development of the racing of horses, as a valuable savant. For example. American sportsmen were not slow to see the advantages of the new Australian starting gate, and promptly imported one of these and installed it at the race track at Belmont Park, Long Island. This starting gate is shown in the illustrations at the top of this page.



The barrier, a new "starting gate" for race tracks, was recently installed at Belmont Park track on Long Island. Above, horses at the get-away; left, showing how the gate is released by electricity and slides up

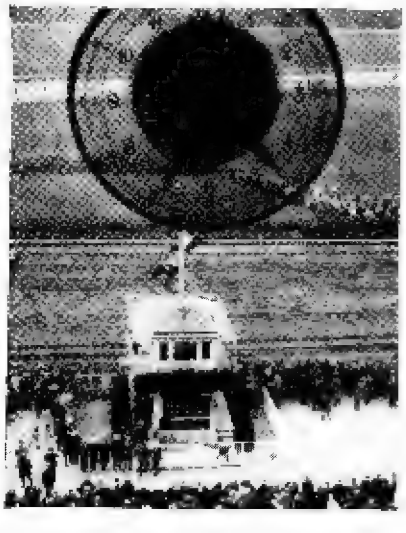


Above we see a close-up of the new starting gate, designed to remedy the difficulty usually encountered at starting. Right, a close-up of the mechanism.

Essentially, the system consists of a series of cable strands, which cross the starting line. These tapes are all connected together and fastened to a carriage that rides up in a suitable guide. The guide is released by an electromagnetic release mechanism, operated by pushing the button on a pear-shaped switch held in the starter's hand. The gate, when released, rises upward rapidly and moves away from the horses.

At this same track, for the first time, a novel time recorder was used. This is in the form of an accurate stop-watch with a transparent face of celluloid, set against the plate in the camera. When the shutter is "clicked" to take the picture of the finish, the watch dial image is reproduced on the camera plate. The photo on this page shows "Blue Larkspur" beating "African," winning the rich "Belmont" stakes, in the time of 2:32 4/5 seconds.

Some race horses get better care than humans. At the race tracks today one can find the latest in electro-cardiographs being applied to horses to see if they are fit. This instrument records the heart-beats of the animals and skilled veterinaries interpret the results. Two of the electrodes are applied to the horse's forelegs and the third encircles the body. One might well wonder if the nervous horse makes the best racer.



A transparent watch dial, placed close to the plate of the camera, shows on the printed picture the exact time of the start and finish of a race.

Determining the soundness and fitness of horses by getting a heart record of a thoroughbred with the new portable electro-cardiograph.

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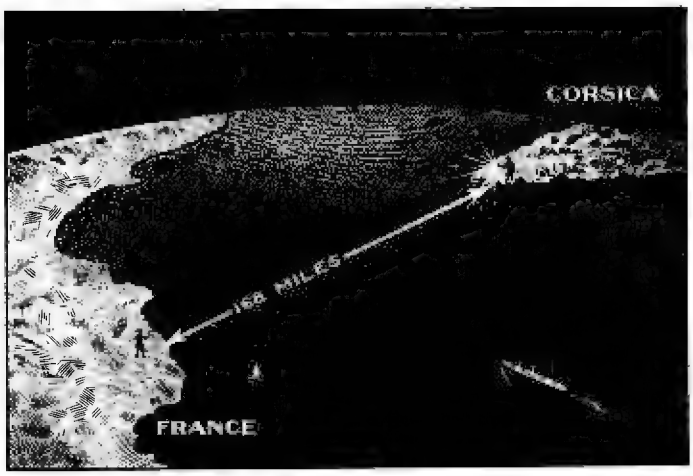
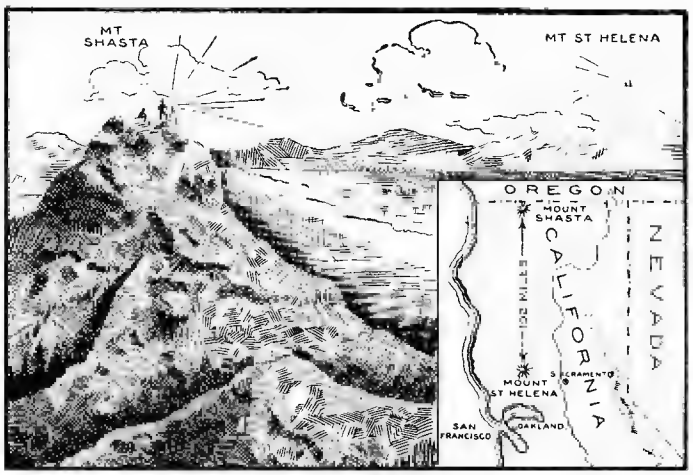
How Far Can We See?



In triangulation work between France and the Isle of Corsica, an officer of the French Geodetic Survey established a line 271 kilometers or approximately 168 miles long.



"The longest observed line" in the United States has been made from helioscope stations situated respectively on the tops of Mt. Shasta and Mt. St. Helena, in California, 192 miles long.

THE report of an officer in the French Geodetic Survey department states that in triangulation work between France and the Isle of Corsica he established a line approximately 168 miles long, "the longest geodetic ray hitherto secured." Dr. Wm. Bowie, of the U. S. Geodetic Survey, declares that there are other lines of vision longer than that claimed by the Frenchman. As a proof he cites the line between Mt. St. Helena and Mt. Shasta, a distance equal to 192 miles. This is "the longest observed line" in the United States and was made with helioscopes using mirrors 12 in. in diameter. This was officially reported by the United States Coast and Geodetic Survey in the year 1880.

In the reports of the trigonometrical survey of northern India it is said that the longest side of a triangle used in computation was only 62.7 miles, and although some of the lines for determining geographical positions were more than 200 miles long, they were merely estimates made from pointing on the visible outlines of peaks against the sky.

No doubt remains of the exactness of the measurements thus obtained as to the range of human vision aided by instruments placed on the earth's surface. The observations which were made by the French engineers were made with lamps at night. They are remarkable, since the line established was for most of its length over water, where the atmosphere is scarcely ever as clear as between the peaks of high mountains. "However," states Dr. Bowie, "it is evident that the United States holds the record for the longest line observed in triangulation."

The human factor must enter into consideration, for the faculty of attention and the individual power of vision will vary in different observers. In considering the ability of the eye to recognize objects at a distance, we must consider two limitations imposed by the earth, namely, the curvature of its surface and the density of the atmosphere.

Can You Answer These Science Questions?

THE following questions on general science can be answered, if you have carefully read the articles appearing on the pages mentioned. Practically no one today considers themselves well read unless they possess a fair knowledge of scientific subjects. Here are the questions:

1—What is the Autogiro? How small a space can this machine stop in? (See page 580.)
2—Can you explain in simple fashion just how a catapult hurls an airplane into the air? (See page 588.)
3—How many fighting planes does Uncle Sam's latest aircraft carrier hold? (See page 589.)
4—On its recent trip around the world, did the *Graf Zeppelin* pass over Constantinople? Name five cities on its route. (See page 590.)
5—What is the scientific name of the invisible rays which Mr. Baird, famous British television inventor, employs in his night-vision apparatus? (See page 591.)
6—If you were given the problem of lighting signs placed on the underside of an airplane's wings, without outlining letters in electric lights or Neon tubes, how would you accomplish the result? (See page 593.)
7—How do airplanes engage and disengage themselves from a dirigible while in flight? (See page 595.)
8—Describe one method whereby ghostly voices can be produced in a spiritualistic trumpet séance? (See page 596.)
9—Where do real "teddy bears" grow? How does the mother bear carry her young offspring? (See page 602.)
10—Can you describe clearly at least two types of oil burners for use in house heating furnaces? (See page 603.)
11—How did a famous French scientist expose the gigantic "Glozel" fraud by means of a special instrument known as a spectrophotometer? (See page 606.)
12—Name two results liable to happen from an improperly functioning thyroid gland? Where is the pituitary gland located and what happens if it fails to function properly? (See page 608.)
13—If you mix two quarts of water with two quarts of alcohol, do you obtain a mixture consisting of four quarts in volume? (See page 610.)
14—If you want to test an engine bearing for tightness or fit, and you cannot get at the bearing directly, how would you go about making such a test with simple apparatus? (See page 614.)
15—In making an animated "home movie" of the cartoon type, how would you get the effect of an owl blinking its eyes? (See page 617.)
16—What simple electrical device would you employ to close a window when it started to rain during the night for example? (See page 618.)
17—What simple chemical can be employed to whiten kid gloves when you are washing them? (See page 625.)
18—How were television images recently transmitted by means of invisible rays? What kind of rays were used, and what sort of sensitive receiving device intercepted the ray pulsations? (See page 629.)

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Relativity and Common Sense

What is a Geodesic? Can You Explain the Fourth Dimension? Is Gravitation a Pull or a Push?

By Donald H. Menzel, Ph.D.

Lick Observatory, Mount Hamilton, Calif.

"'If seven maids with seven mops
Swept it for half a year,
Do you suppose,' the walrus said,
'That they could get it clear?'
'I doubt it,' said the carpenter,
And shed a bitter tear."
—Lewis Carroll

THERE are times, during the period that I have been writing this series of articles on relativity, that I have been inclined to the carpenter's pessimistic outlook. But of late the sky seems to be clearing, and it seems that these expositions are accomplishing the purpose for which they were intended. My correspondents are increasing in number all the time, but their questions are becoming fewer and fewer. Among the queries I have received, one in particular has been asked by many persons. The following excerpt from a letter will explain what it is:

"You say that gravitation is an illusion; that no force is felt by an object falling freely in space. It would seem to me that the motion is due to the force. Please explain your viewpoint more fully."

I take pleasure in turning this task over to your three old friends, the Relativist, the Physicist, and the Layman, who are engaged in earnest conversation:

* * *

Layman—If gravitation is an illusion, what law do you substitute for it?

Relativist—The law proposed by relativity is essentially simple; let me discuss it by analogy. From knowledge and observation, a student of human behavior might be able to predict certain things about the movements of humanity as a whole. He probably would not predict with any exactness the actions of animate objects. But all of us are more or less lazy. Who will make three trips up and down the stairs when two will do? A scientific mind might express this tendency of human nature in the statement: "People move in such a manner that they traverse a minimum amount of space in satisfying their desires." What those desires are and how they arise cannot be foretold.

P.—But what has this to do with relativity?

R.—In somewhat the same manner, relativity enables the astronomer to predict how and where any object—say a planet or comet—will move. The actual calculation of the path is not easy, but the relativistic law that governs the motion is simple—much simpler than Newton's. It reminds one of the statement I just made about people.

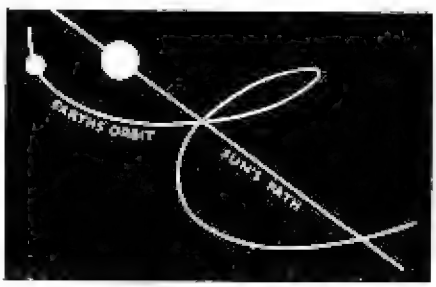

Fig. 1. The earth's path in space is a geodesic. Its path is like this illustration.

L.—That planets move so as to take the shortest possible path? Would you have us believe that Nature is lazy.

Fig. 2. A space-time picture of a house. The human mind cannot visualize time. You cannot picture all at once the entire history of a house from the time of its construction.

Physicist—Don't try to tell me that planets travel in straight lines. You know very well that the earth's orbit in space is more like this. (Fig 1.)

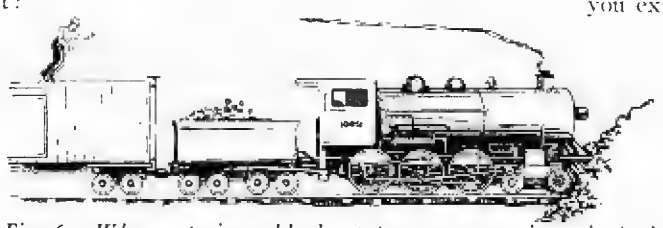

Fig. 6. When a train suddenly stops, anyone on it or in it, is thrown forward, as though attracted by a force.

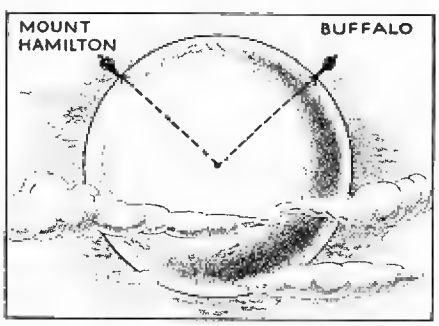

Fig. 4. A correspondent writes . . . "Here I am at Buffalo, you at Mount Hamilton. We both stick out from the earth in different directions: there must be a force attracting us toward the center of the earth." . . . But is there such a force?

What Is a Geodesic?

R—Not so fast. Don't jump at conclusions. No, I do not claim that the earth's path is straight in the sense you mean. To be more accurate, the earth's path is a geodesic.

L.—What in the world is that?

R.—It is a term used by mathematicians to denote the maximum or minimum distance between two points.

L.—Is not a straight line a geodesic?

R.—Yes, indeed. But all geodesics are not "straight lines" in space. I must remind you again that Relativity deals with four dimensions—three of space, and one of time.

L.—Four dimensions! Every time you mention them my head starts to go round.

R.—That is only because you are trying to make it more difficult and complicated than it really is. There *you* stand. I can describe you in three dimensions if you like—the geometrical proportions of your face and figure, say. But there is one obvious thing lacking. I might well have been discussing a statue. You move. Before I have half finished my description you have altered considerably. The difficulty is obvious. I think. I must describe you in *time* as well as *space* for the very reason that you exist. That is why *time* and *space* are so bound up together. Everything is *four-dimensional*. Einstein's chief contribution to philosophical thought was his formal proof (mathematical, of course) that it is absolutely impossible to separate completely *time* and *space*.

P.—To go back then to our original question. You were defining a geodesic.

R.—Oh, yes. Speaking somewhat inexactly, I might say that a relativity geodesic is a four-dimensional straight line. There is one marked difference. Where your straight line is often defined as the shortest distance between two points, in relativity a geodesic is the longest.

P.—That sounds like metaphysics to me. I can't picture what the longest path would look like.

Space-Time Image of a House

R.—You're not supposed to picture it. You can't, for the simple reason that the human mind is not able to visualize time. (*Continued on page* 660)

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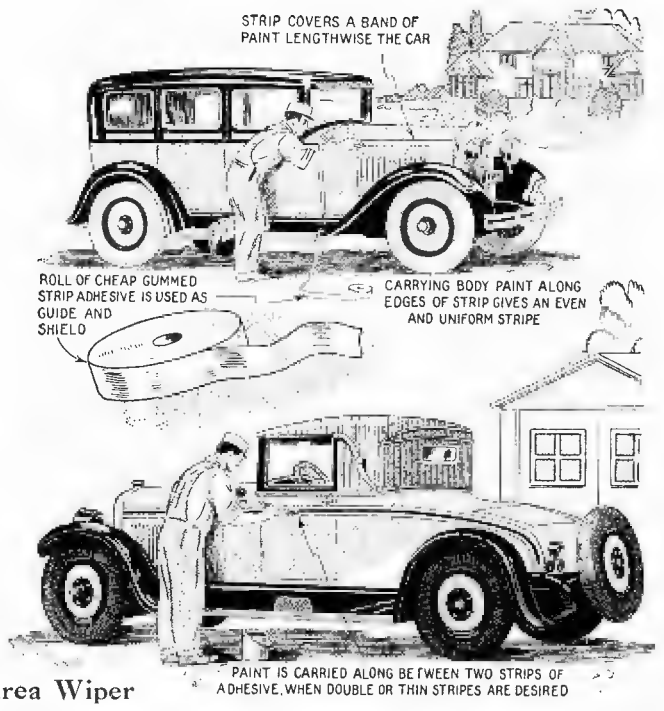
Motor Hints

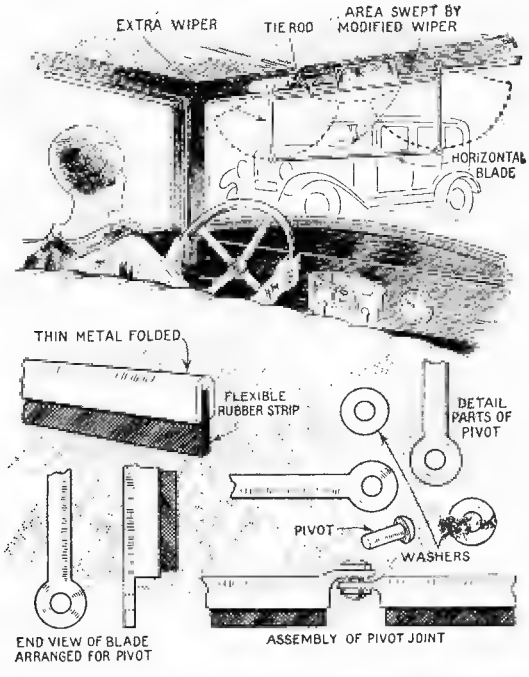
By George A. Luers

DO YOU KNOW—the car top should not be washed with gasoline, whisked or rubbed vigorously, which treatment would make the cover porous, leaky and cause rotting. A thin coat of top dressing each six months, carefully flowed under the binding strips at the edges, will maintain the top in watertight condition and preserve it.


STRIP COVERS A BAND OF PAINT LENGTHWISE THE CAR
ROLL OF CHEAP GUMMED STRIP ADHESIVE IS USED AS GUIDE AND SHIELD
CARRYING BODY PAINT ALONG EDGES OF STRIP GIVES AN EVEN AND UNIFORM STRIPE
PAINT IS CARRIED ALONG BETWEEN TWO STRIPS OF ADHESIVE, WHEN DOUBLE OR THIN STRIPES ARE DESIRED

Painting Stripes on Auto

PAINTING stripes on the bodies of automobiles without a guide is too much of a task for untrained painters. An effective guide can be made with ordinary gummed strip adhesive which is moistened and pasted along the length of the car. It is easy to remove this paper after the painting is done.

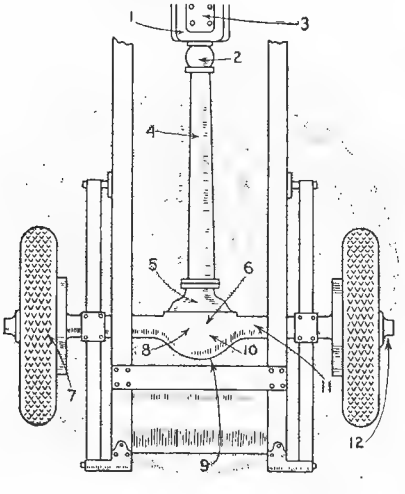


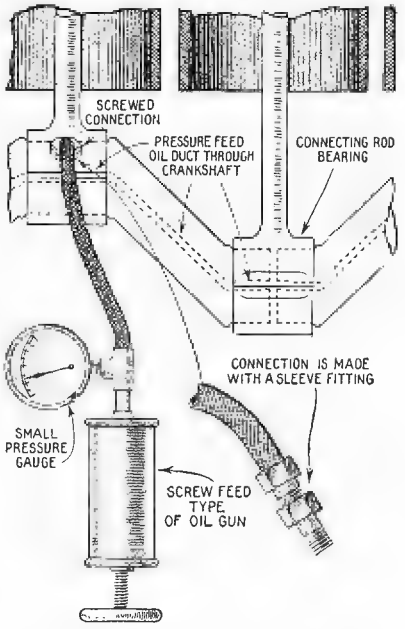
Large Area Wiper

WHERE a car is equipped with an automatic or hand-type windshield wiper, it is possible to connect up a second wiper on the opposite side of the windshield. The windshield can be wiped for a much increased area, if these two wipers are joined by a third blade placed in a horizontal position as indicated. A slight tilt of the lower blade so that the water is scraped downward increases the effectiveness of the blade.

Rear Axle Troubles Indicated

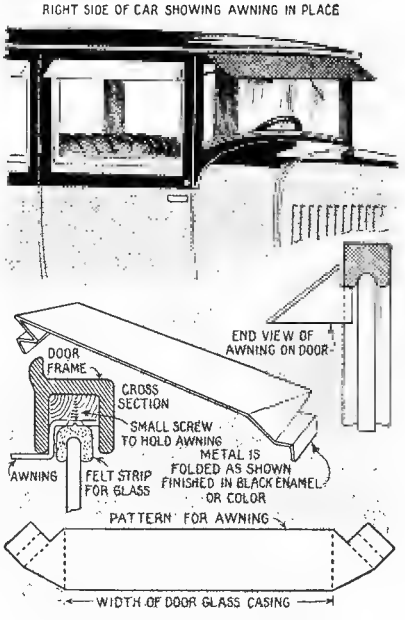
BREAKAGE of gears, universal joints, bearings, or differential parts are usually preceded by noisy operation of the car. In the accompanying drawing, the points in the rear axle which require adjustment and renewal most frequently are shown. Use this to check up with when the car clashes heavily or jerks loudly when driving.




SCREWED CONNECTION
PRESSURE FEED OIL DUCT THROUGH CRANKSHAFT
CONNECTING ROD BEARING
CONNECTION IS MADE WITH A SLEEVE FITTING
SMALL PRESSURE GAUGE
SCREW FEED TYPE OF OIL GUN

Tire Gauge Checks Bearings

TO check fitted crankshaft and connecting rods in an engine, a small pressure gauge is connected to an oil gun with connections which would fit into the oil tube connections of the bearings. Loose bearings cause a rapid drop of pressure.


RIGHT SIDE OF CAR SHOWING AWNING IN PLACE
END VIEW OF AWNING ON DOOR
DOOR FRAME
CROSS SECTION
SMALL SCREW TO HOLD AWNING
METAL IS FOLDED AS SHOWN FINISHED IN BLACK ENAMEL OR COLOR
AWNING
FELT STRIP FOR GLASS
PATTERN FOR AWNING
WIDTH OF DOOR GLASS CASING

Tin Car Awnings

EXCELLENT side awnings that are not so conspicuous as the canvas type can be made from sheet tin and painted the same color as the car body. The shape of these guards follows along the lines of the front shield visor. Stiff paper patterns are made as shown by the sketch and these are fitted. The sheet tin is cut from these patterns.

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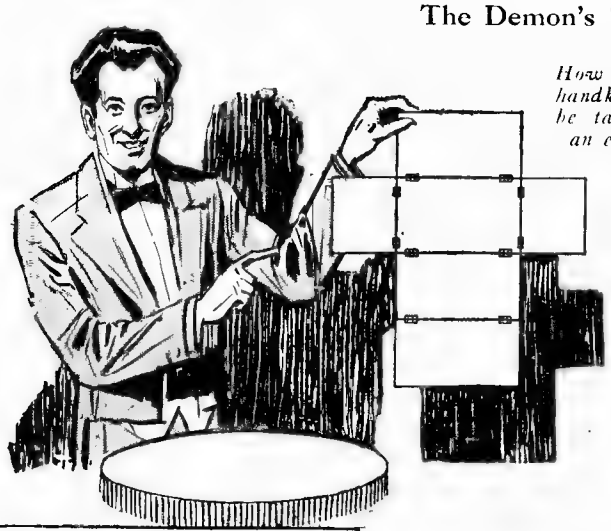
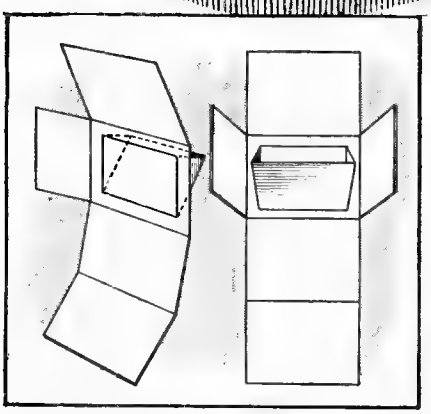
The Demon's Treasure Chest



How rabbits and handkerchiefs can be taken out of an empty case.

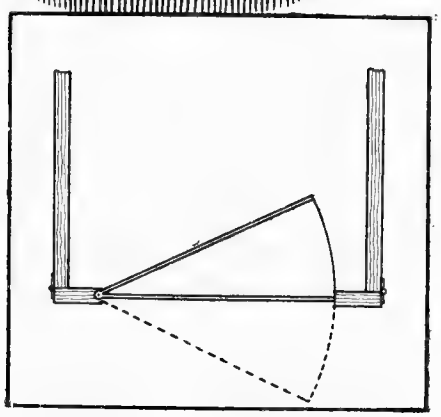


This shows how the Demon's Treasure Chest effect is presented. The sides of the box are on hinges, and when the box is held up, it can be shown empty from both the front and back. One side of the box has a triangular compartment, housing the load. This can be moved back and forth under cover of a turning movement.

MAGIC

By Thurninger

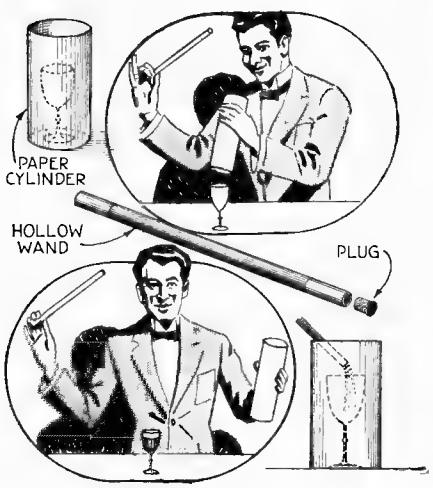
No. 75 of a Series



When the box is all folded together, the magician inserts his hand and withdraws live animals, ribbons, silks, and the like. The detail view shows how the feke is hinged to allow for the examination of the box when unfolded. The feke is always moved to the side away from the audience.

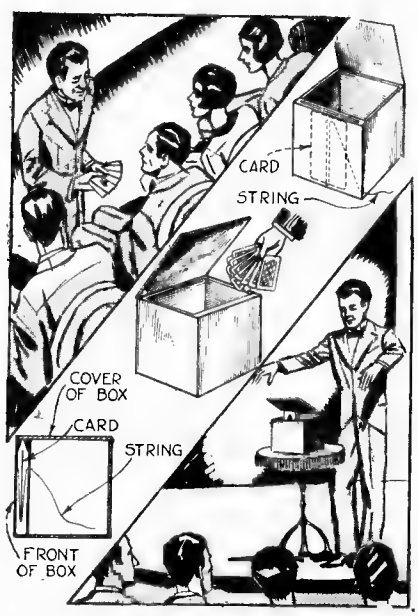
Anti-Prohibition Demonstration

THE wizard is often called upon to produce a drink or two to quench the thirst of visiting friends, so he secures a glass and covers it by a paper cylinder. Moving his wand around on the inside of the cylinder to produce the necessary mesmeric passes, he withdraws the paper covering and raises the glass brimful of any drink he may have decided upon. The explanation lies in the fact that the wand contains the liquid.



The Obedient Card

THE magician passes a deck of cards around for examination. These are shuffled and returned. He requests a spectator to pick one at random, note the suit, return it, and shuffle the deck. The deck is picked up between the fingers of the magician's outstretched hand, and dropped into a small wooden box. The spectator is now asked to name the card. As he does so, the card called slowly rises up, pushing up the cover of the box. Secret: The card is forced, a duplicate being contained in a compartment built in the box as the diagram shows. The string does the work.



The Disintegrating Box

IN this effect an egg is shown and examined. On being returned to the magician, he puts it in a box just big enough to house it, closes the cover, and a moment later shows the box empty. Secret: A rubber egg is substituted for the real egg. During the act of closing the box a flap is raised which squeezes the egg between the double-back cover. A catch holds the tin flap in place.

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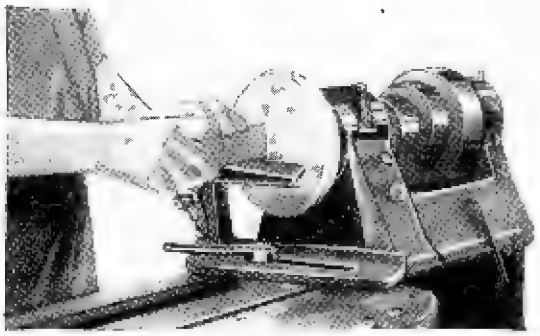
How to Sand, Grind and Polish on the Lathe

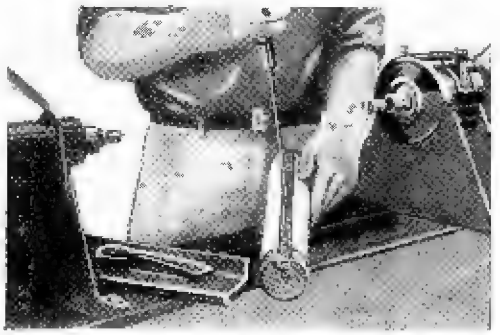
Home Wood Turning

Article No. 16 in a Series

By H. L Weatherby

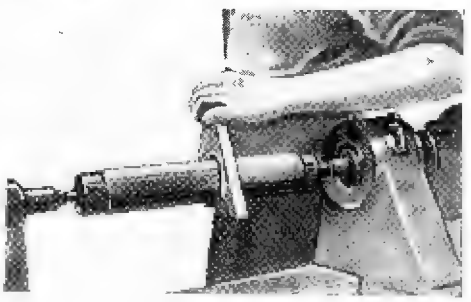


Sanding small, flat pieces on a sandpaper disc.



Fastening the sandpaper in place on a sanding cylinder.

THE lathe in the home workshop can be made to perform a great many things that the average worker does not realize can be done with it. Besides regular spindle and face-plate turning operations, which have been rather fully covered in this series, we can use the lathe for sanding flat and curved surfaces, for boring and drilling, for buffing and polishing, for grinding, and for veining. Besides these operations, no doubt the readers of these articles have discovered many other uses to which the lathe may be put, and the author would be very glad to have these suggestions in the form of pencil sketches or carefully written explanation. One dollar each will be paid for any of these suggestions that can be used. Due credit will be given and they will be published when enough of them have been received to warrant another article similar to this one. Simply send your suggestions in, being sure to address the writer, in care of SCIENCE AND INVENTION Magazine.



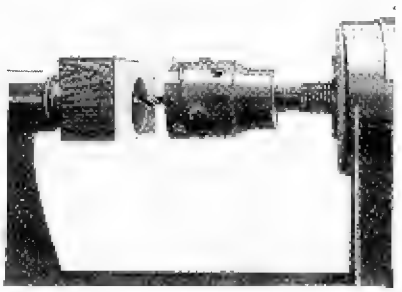
Sanding concave edges is an easy thing to do on a lathe.

Sanding on the Lathe

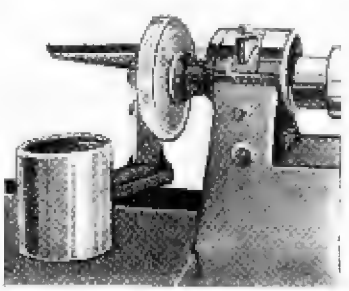
PERHAPS the operation that the average wood worker will perform most often on the lathe, besides that of regular turning, is sanding. Sanding of concave curved surfaces can be done particularly well with a sandpaper covered cylinder, and smoothing up of these surfaces is one of the hardest operations to perform successfully by hand.

To make a cylinder for this purpose, it is only necessary to turn a straight cylinder between centers to the desired diameter. For small curves this should, of course, be a small cylinder and for larger work it should be of greater diameter. A tapered piece may be turned for special sanding. When this cylinder has been turned it is only necessary to cut a groove with sides that slant in, as the drawing indicates, and cut a strip of wood to fit it loosely, this piece to hold the paper down and itself to be held in place with about three countersunk screws. The edges of the groove should be rounded to prevent cutting of the paper. To mount the sandpaper, cut it to the approximate size, wrap tightly around the cylinder and fasten the wooden strip in place, holding the paper securely and smoothly.

For flat sanding of small articles, a piece of paper may be glued to a flat circular piece of wood on a face plate; or it may be tacked around the edges or a wire clamp may be used to hold it in place.

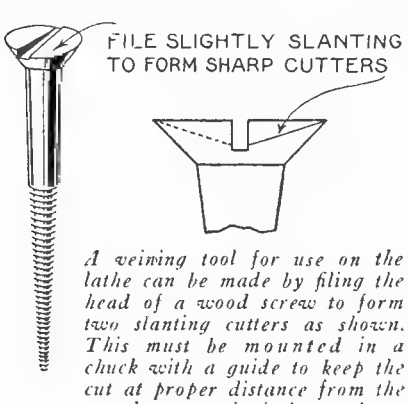


A drill mounted in a chuck makes short work of drilling or boring.

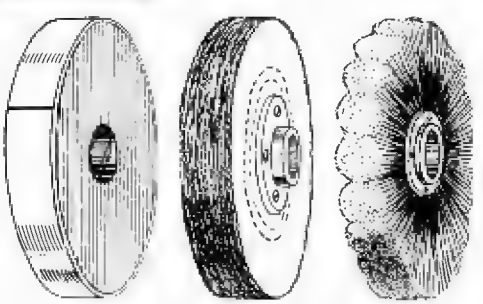


An emery wheel mounted on a lathe with water for cooling the tool.

For flat sanding of larger pieces the writer has used a home-made drum sander similar to the one illustrated. A large cylinder of wood, mounted to a face plate with some sort of a table on which to slide the work over is about all there is to it. The sandpaper can be purchased in large sizes from the mill and should be held in place as described for the smaller cylinder. A felt covering glued to this cylinder will give a better surface on which to mount the paper. This would be rather heavy for a small lathe.



A veining tool for use on the lathe can be made by filing the head of a wood screw to form two slanting cutters as shown. This must be mounted in a chuck with a guide to keep the cut at proper distance from the edge or end of the work.



Polishing wheels for metal work are made from wood with a leather or emery covering. Cloth buffing wheels are used for fine polishing and wire brushes can be used for rough cleaning up of metal.

(*Continued on page 648*)

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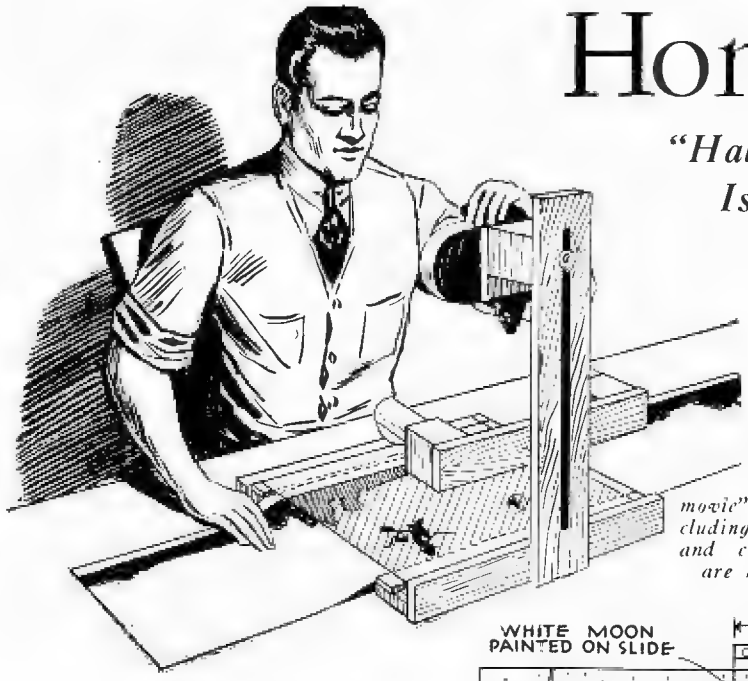
Home Movies

"Hallowe'en Movie" in Animated Style Is Easily Made by the Amateur in the Manner Here Explained.

By Don Bennett



The simple apparatus necessary for making animated "home movie" cartoons, including the lights and camera stand, are here shown.

"HELLO, Mr. Jones. Any new stunts today?"

"Why, hello there, stranger. I haven't seen you in several weeks. Another vacation so soon?"

"Well, not exactly a vacation, but I heard that there were some fine color subjects up-state and I took a run up there to try out my new color lens. By the way, I'm planning a Hallowe'en party and I'd like to pull something novel. What could you suggest?"

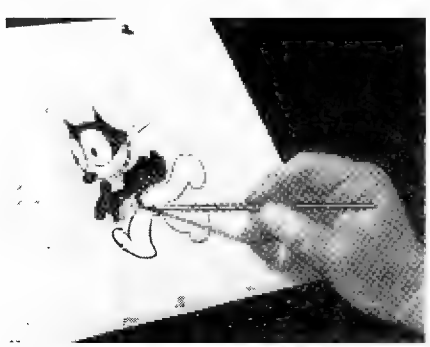
"Well—it's rather hard to make a playlet with Hallowe'en characters in it, because they're all caricatures, but how about making a cartoon, an animated one?"

"That's too much work for anyone who is as poor an artist as I am. You have to be good to make cartoons."

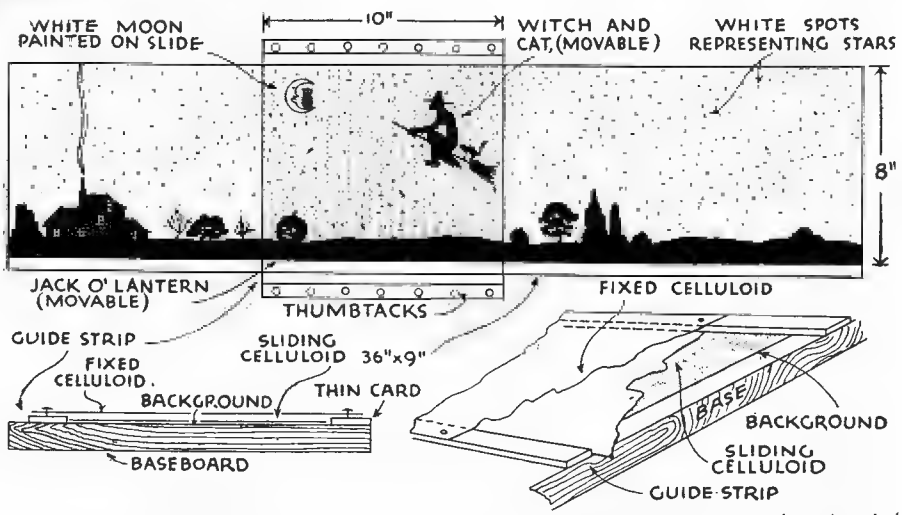
"Not the way I make them, Mr. Blake. I only make a few drawings and they serve for quite a lot of footage. I use jointed figures and photograph them in silhouette."

"That's an idea, all right. Could you give me an idea of how to use that method for the party?"

"Certainly, but before I start, maybe you'd like to see these photos a friend of mine just sent me on how the big cartoons are made. Yes? Here they are. The way they make these films is to sketch out an idea and make a few sample drawings for the continuity.

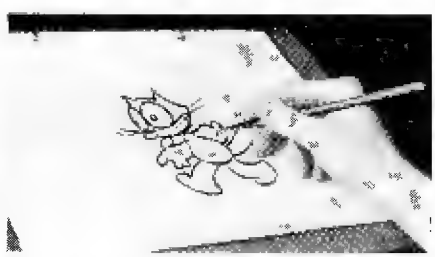


Filling in the outline with black ink, the final step before photographing. Fig. 1-C.



The method of arranging the moving celluloid strip on which the scenery is painted, is clearly illustrated in the above picture, together with the construction details for the base-board.

Then the animator gets to work and sketches the outlines of the figures (Fig. 1-A). You'll notice in this photo that he is using a special board with two pilot pins at the top. All the paper he uses has corresponding holes punched along the edge so that the consecutive drawings are in *perfect registration*. Also note that he is sketching on a piece of celluloid laid over the base



Here the artist is outlining the sketch of "Felix" in ink. Fig. 1-B.

drawing. This celluloid represents a great time saving, as on it are drawn the moving parts, while the base parts of the drawing are drawn only once, on the paper. For example: in this drawing Felix seems to be walking. A rule of animation provides that eight movements complete a step in walking. Felix in walking will move his arms and legs, his head and tail will keep still. The animator then makes a drawing of Felix's head, body and tail on the paper. He then prepares eight celluloids, each with the arms and legs a little more advanced than in the previous drawing. When photographed, the paper drawing is put on the board and the "cells" are laid in rotation over the paper, each one being photographed in turn, a frame

Photo Courtesy Movie Makers

Animating Pat Sullivan's famous "Felix the Cat"; artist is drawing on celluloid sheet, using drawing on paper underneath as a guide. Fig. 1-A.

of film for every drawing. This group of eight is used over and over as long as the movement continues. If Felix turns his head to look back, another base drawing, or possibly another whole set of eight, must (*Continued on page* 643)

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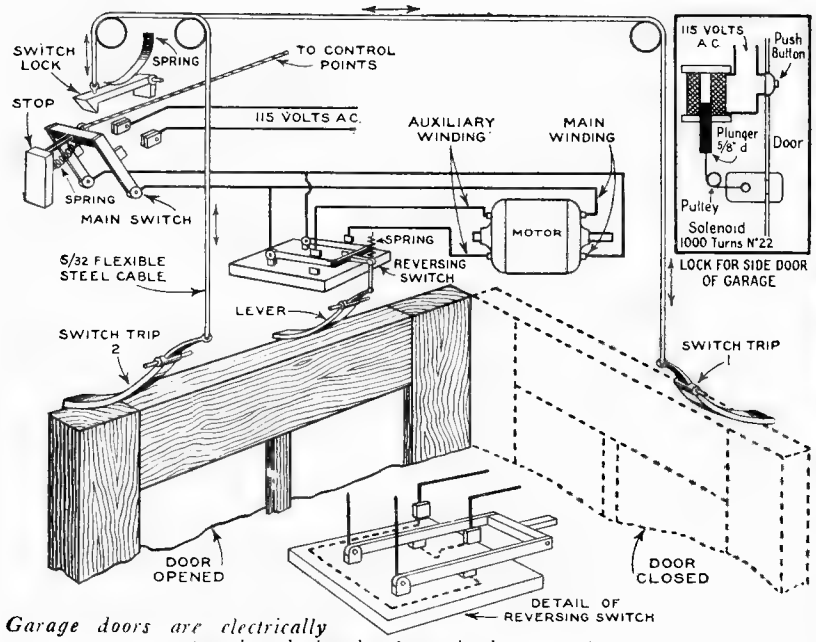


Garage doors are electrically opened and closed when wired up as shown.

How Mr. Pyle opens and closes his garage doors.

You Can ELECTRIC

Mr. Pyle Explains Clearly How He Makes Doors, Rock the Baby Carriage, Close

By W. R. Pyle

Head of Physics Department, Wilmington College, Wilmington, Ohio.

MANY convenient yet inexpensive pieces of apparatus can easily be constructed for use in the home whereby electricity performs many monotonous tasks not usually assigned to it.

In addition to the common electrical appliances why not an electrical baby rocker, electrical garage door control, electric fan cut-off, electric mechanism to close the bedroom windows and open the heat register et cetera?

Electric Baby Rocker

THE essential parts of the electric baby rocker are the speed-reducing belts and pulleys, motor, crank wheel, connecting slat and coupling shoe, all of which are shown in the photograph at 1, 2, 3 and 4 respectively. All the pulleys and axles are wood while the crank wheel and axle are metal. For belts the automobile fan belts prove very satisfactory and they are readily available.

A ¼ h.p. induction motor supplies abundant power and with very little noise. The writer's experience has indicated that the slight purring sound of the motor is entrancing instead of annoying to the sleepy infant. Incidentally the motor constitutes the major expense as well as contributes about nine-tenths of the weight to the rocker. This weight (about 35 lbs.) proves advantageous since the rocker will remain stationary due to its own weight if rubber knobs are placed at the corners of the base.

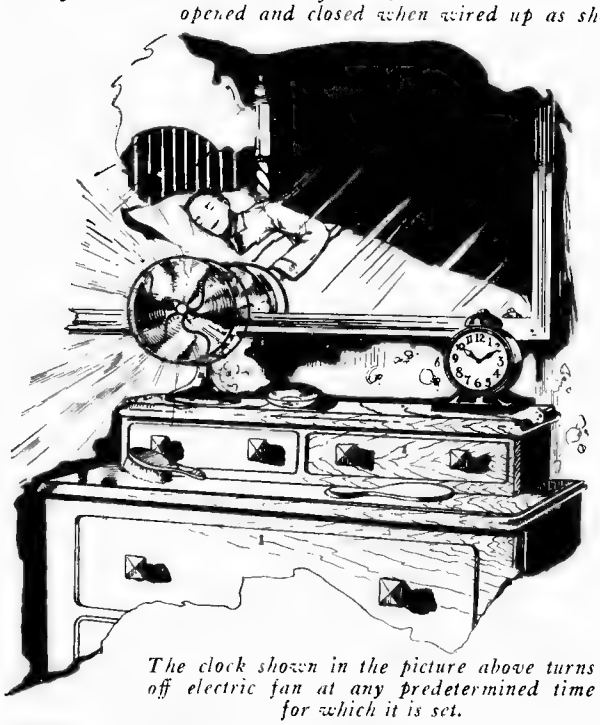
The coupling shoe, which by means of a thumb screw is quickly and easily attached to the bed-on-wheels or the baby carriage, is fastened to the connecting slat by a rubber shock absorber. The absorber is made from a piece of heavy inner tube and thus the reversal of the motion is gently effected.

The accompanying drawing illustrates the plan view of the rocker while the photograph shows the wooden box in which the rocker is installed. The front and back of the box are made of thin laminated board.

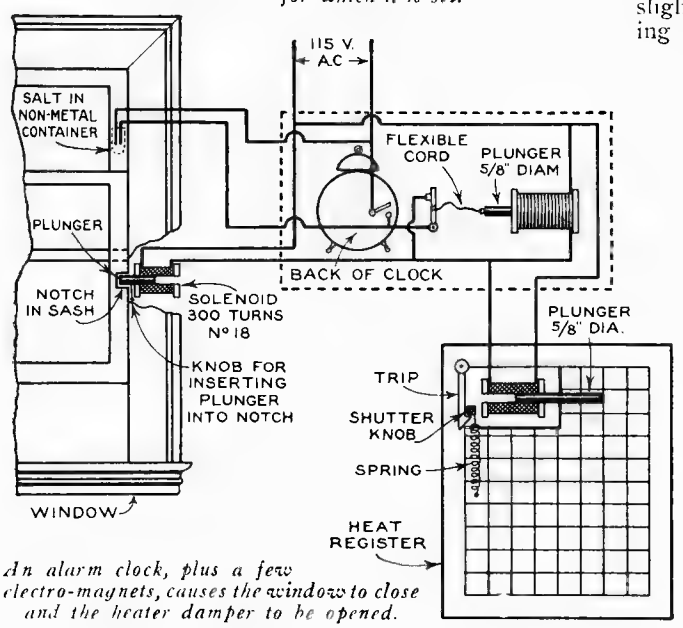
The device made portable by the handle on top of the box can be attached to any electrical outlet.

Electric Garage Door Control

THE simple electric garage door control shown in the photograph consists of a reversing switch lever at 1; a trip lever at 2 which trips the main switch when the doors are open; a trip lever at 3 which releases the main switch when the doors are closed; the main switch at 4; a control cable at 5 by means of which the main switch can be actu-



The clock shown in the picture above turns off electric fan at any predetermined time for which it is set.



An alarm clock, plus a few electro-magnets, causes the window to close and the heater damper to be opened.

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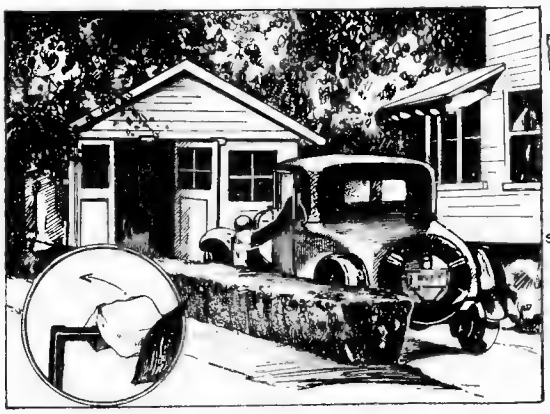
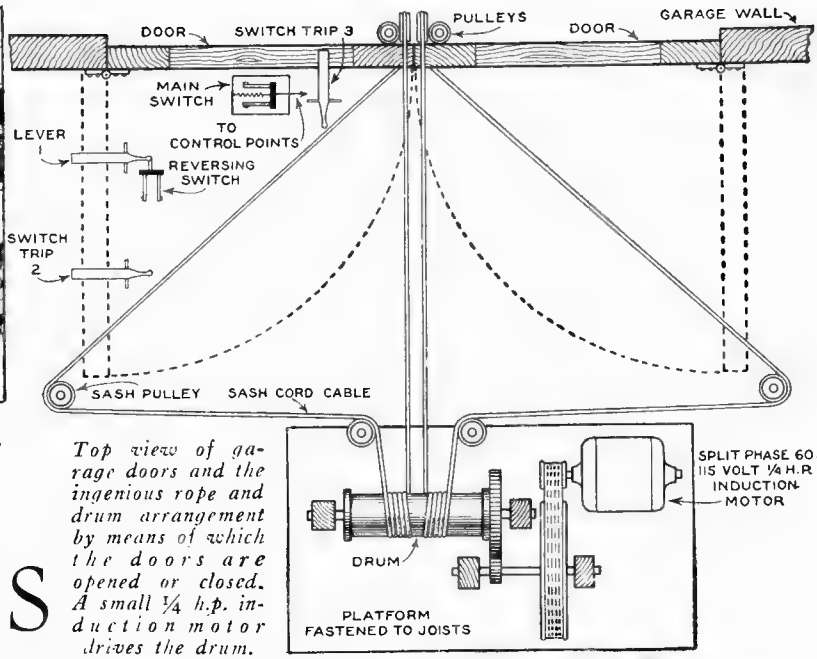


Reach out, press lever, and the garage doors open.



Top view of garage doors and the ingenious rope and drum arrangement by means of which the doors are opened or closed. A small ¼ h.p. induction motor drives the drum.

Make These SERVANTS

Electricity Open and Close His Garage the Windows, and Turn On the Heat.

ated either for opening or closing the doors; a drum at 6; and the speed-reducing mechanism and motor at 7.

A cable can be run from the main switch to any number of control points. The writer has found it convenient to have a control point on a post about 30 feet in front of the garage, at the edge of the drive, where it is accessible from the driver's seat. Two control points are inside the garage, one accessible from the driver's seat when the car is in the garage, the other at a point which is just inside of the small side door of the garage.

If the doors are to be opened the main switch is closed from some control point and held closed about two seconds. During this time the motor rotates the drum which by means of the cable starts opening the doors. When they are open slightly the switch trip 3 (see above diagram) allows the switch lock to drop down, thus locking the main switch until the doors, when almost open, strike switch trip 2, releasing the main switch and stopping the doors.

The doors when open also lift the lever of the reversing switch, thence reversing the polarity of the auxiliary winding of the split-phase motor.

Now if the main switch is again held closed for two seconds, the motor will run in the reverse direction and when the doors are slightly closed, switch trip 2 allows the main switch to be locked again, until the door strikes switch trip 3 and again opens the main switch.

Further, when the doors are slightly closed, the compression spring reverses the polarity of the auxiliary winding again, but since the motor has already started, the auxiliary winding has been disconnected by the centrifugal cut-out inside the motor and the motor will continue to rotate in the same direction, until it is stopped when the doors are closed. Then the next time the main switch is closed the motor will rotate in the reverse direction and proceed to open the doors again.

The accompanying drawing shows clearly how the drum pays out the cable as fast as it winds it up, thus being able to open or close the doors, depending on the direction of rotation.

The doors require seven seconds for either opening or closing, and will either open or close the doors 171 times for one penny's worth of electricity at 10c per kw.hr. Snow does not hinder the operation of the doors, since they open in. The writer buried a pipe under the drive-way through which the main switch could be actuated by the wheel of the car running over a small trip, but sleet and snow prevented its use in the winter. The manual control is satisfactory at all times.

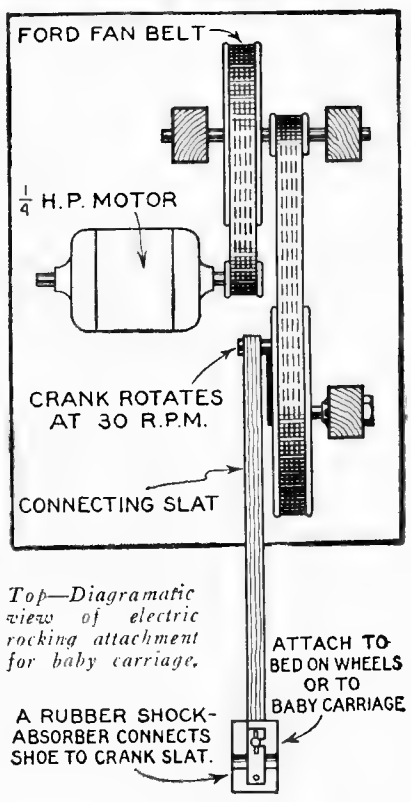
The door on the reader's right in the exterior view of the garage is a stationary fake one, and was built only for symmetry of appearance. A small door on the side of the garage next to the house is unlocked by merely pressing a button just outside of the door. (See diagram.) The push button actuates a solenoid which pulls the latch.

To lock the garage at night it is only necessary to push a switch in the kitchen which cuts off the power to the large doors as well as the side door.

A common alarm clock attached to electrical devices makes possible re-

(*Continued on page 658*)

Rocking baby to sleep by electric motor is the ultra modern way, according to Mr. Pyle. The accompanying illustration, together with diagram below, shows how anyone, a little handy with tools, can rig up an electric rocking attachment for any baby carriage.


FORD FAN BELT
¼ H.P. MOTOR
CRANK ROTATES AT 30 R.P.M.
CONNECTING SLAT
ATTACH TO BED ON WHEELS OR TO BABY CARRIAGE
A RUBBER SHOCK-ABSORBER CONNECTS SHOE TO CRANK SLAT.

Top—Diagramatic view of electric rocking attachment for baby carriage.

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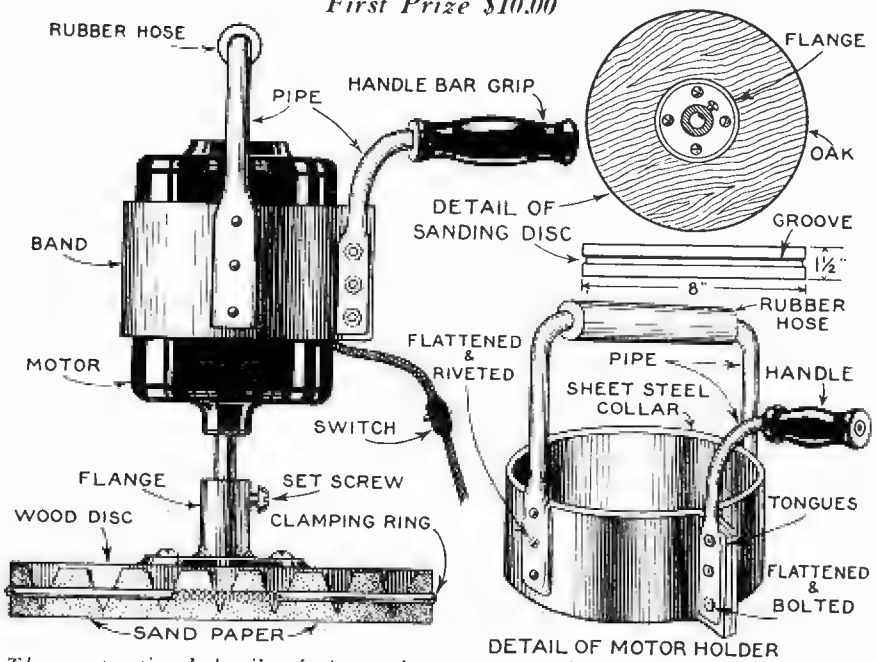
Electric Sander Makes Wood-Finishing Easy

First Prize $10.00



The constructional details of the sander are shown in the diagram above. The dimensions will depend upon the size of the motor available.

FOR the amateur carpenter and cabinet maker nothing is so tedious as to polish a surface to a velvety smoothness, using sandpaper and elbow grease. If you have electric power, a nice little sanding machine can be constructed as shown that will impart a beautiful finish to both hard and soft woods, and do it in a minimum of time with little effort.

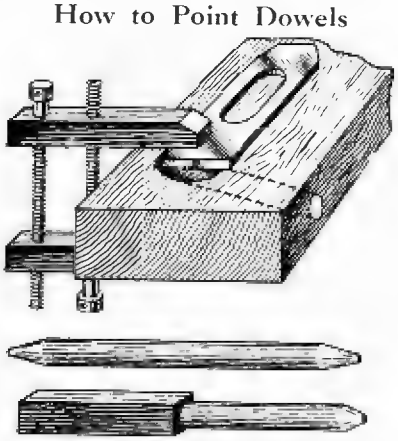
A small ⅛ to 1/12 H. P. motor will be necessary for the power, either AC or DC, according to the current available.

The sanding disc consists of a hardwood disc, preferably of oak or ash.

It will be found that only a light pressure is necessary with this sander. Hold vertically, using both hands, and wipe spinning disk across the grain and then with it in circular movements. Only a few minutes will be required to do work that would otherwise have required much greater time.

It will be noticed that the sandpaper disks are toothed all around the edge for a depth of about one inch. This will allow the paper to fit closely and snugly to the disk face. Use 00 sandpaper for all particular work and No. 1 for ordinary surfacing.—*L. B. Robbins.*

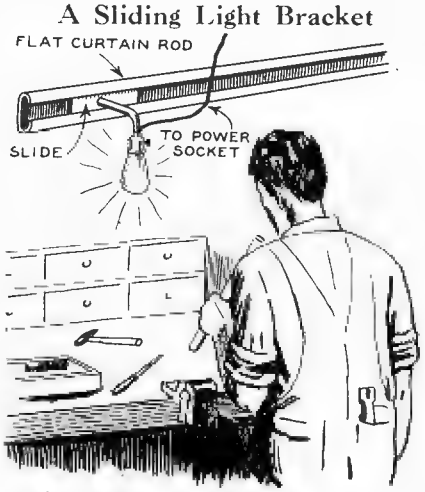
How to Point Dowels



Above is shown the construction of the dowel pointer and several samples of the work done.

A SIMPLE dowel pointer can be made with a block of wood, the blade of a plane, and an ordinary carpenter's clamp. This will have many uses around the workshop.

A Sliding Light Bracket



It is hardly possible to construct a simpler or cheaper light bracket that is so convenient as the one shown above.

THE inconvenience of having a connection cord dangling over the work bench can be easily done away with by using a sliding bracket that is easily mounted on the wall over the bench. Secure a length of old flat curtain rod, and cut a piece of sheet steel two inches long and just wide enough to slide freely in the groove formed by the curtain rod. To this rivet the electric lamp bracket. Screw the curtain rod to the wall over the work bench. The lamp bracket can be placed in the rod, slide fashion, and moved from one side of the bench to the other without difficulty. With this arrangement it is possible to move the light to a convenient spot, so that work can be done without bothersome shadows.—*K. B. Murray.*

Hints *for*

A "Rubber" Sandpaper Block

A SIMPLE sandpaper block which takes only a few minutes to construct can be made from a block of rubber of the desired size. Rubber for this purpose may be obtained from old discarded truck tires or bumper blocks. Slits should be made in the end as shown and sharp pointed nails driven through to hold the sandpaper. The spring of the rubber clamps the sandpaper securely.

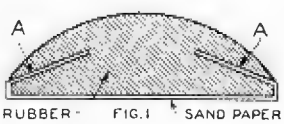


FIG. 1

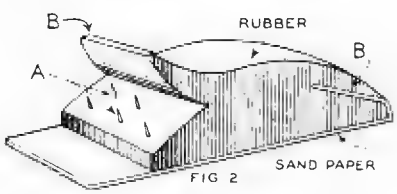


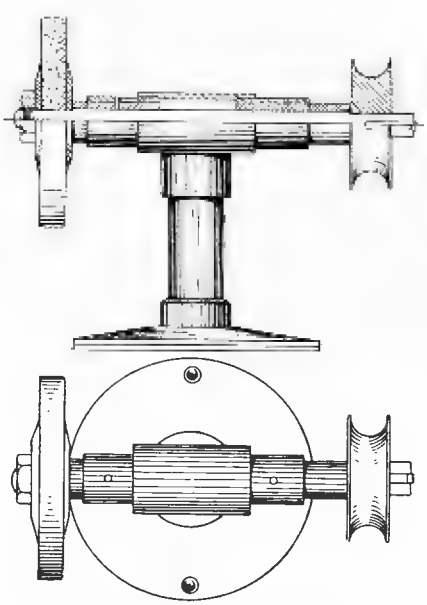
FIG 2

Grinding and Buffing Wheel

AN inexpensive grinder and buffing wheel filling all the reuirements for a small workshop may be constructed from discarded pieces of pipe and an old floor flange used as a base for it.

The T serves as a support for the shaft and the two bearings which are constructed by babbiting two smaller pieces of piping and fitting them to the T which is supported by another piece of pipe screwed into the T and fastened to a floor flange as a base.

The shaft may be made from scrap cold rolled steel. Sufficient details are supplied in the drawing to permit the completion of this grinder.



Details of buffing wheel.

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the Home Workshop

Pipe-Fitting Scroll Saw

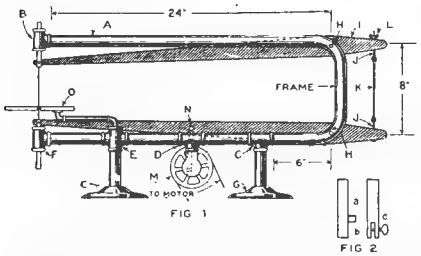


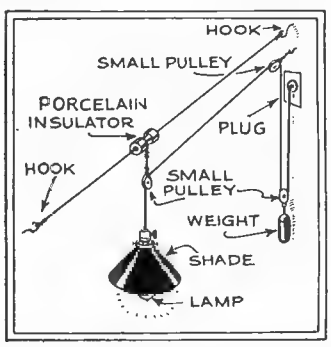
FIG 1

FIG 2

AN accurate power scroll saw can be made from standard pipe fittings. The frame for holding the saw blades is made of hard wood.—*F. Carlberg.*

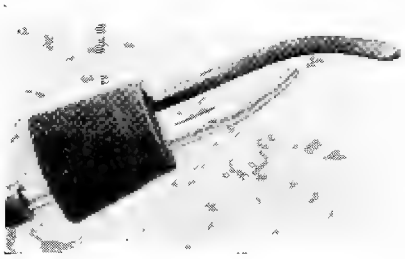
Portable Shop Light

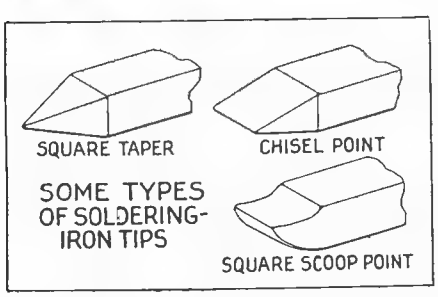
A WIRE stretched across the workshop as shown below will be found a great convenience. A glass or porcelain insulator is used to carry the lamp along the wire and the slack cord is taken up at one end, as shown.—*H. Kramer.*



Self-Heating Gas Soldering Iron

A COPPER rod inserted in a cork or a block of asbestos so that it is held firmly, a medicine dropper fastened next to it so that the tip is about one inch away from the cork, and a rubber tube fastened to the other end of the glass tip make a simple gas soldering iron. The gas supply should be so adjusted that the flame at the end of the tip is about the size of a pea.—*R. B. Wailes.*

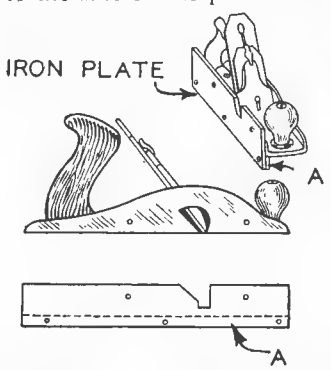




Various types of tips may be cut for different kinds of work as shown above. A rubber tube is fastened to the end of the medicine dropper for the gas supply.

Planing Joints

AN iron plate fitted as shown in the sketch will make it easy to join boards straight and square. Two holes are bored and tapped in the side of the plane to take two screws, which hold the plate to the side of the plane. A small

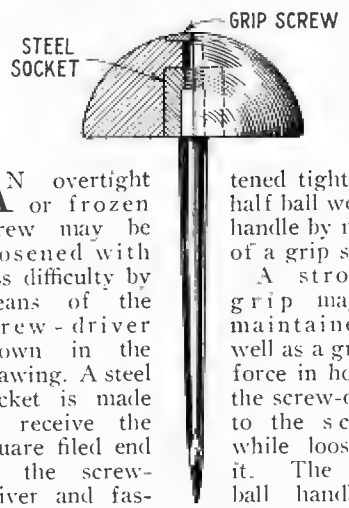


strip of wood (A) is screwed to the plate to bring the position of the cutting blade in contact with the work.—*J. Lovett.*

$10.00 MONTHLY FOR BEST HINT

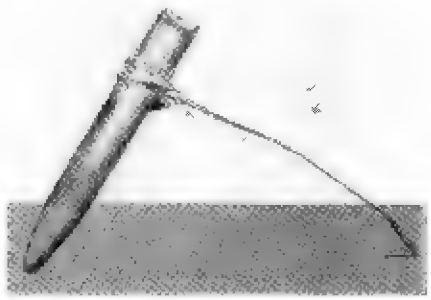
SEND us a photograph or sketch of your own hint for the home workshop. $10.00 is paid monthly for the best hint accepted and published. Others that we publish are paid for at regular rates. Here is a chance for you to win a prize for a useful workshop hint.

Super-Grip Screw-Driver



AN overtight or frozen screw may be loosened with less difficulty by means of the screw-driver shown in the drawing. A steel socket is made to receive the square filed end of the screw-driver and fastened tight in a half ball wooden handle by means of a grip screw. A stronger grip may be maintained as well as a greater force in holding the screw-driver to the screw while loosening it. The half-ball handle is detachable so as to take up little room in the toolbox when not in use.

Useful Electrical Cement

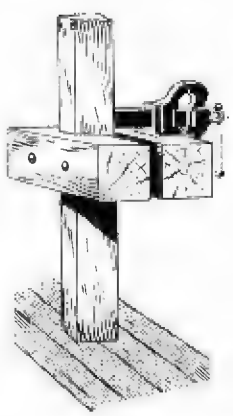


Copper wire cemented to a carbon rod.

A PLASTIC electrically conductive cement which will unite pieces of work that cannot be soldered can be made from the following formula:

Copper powder 1 gram, iron powder 1/10 gram, magnesium chloride .01 of a gram, and a trace of ammonium chloride, magnesium oxide and phosphoric anhydride. The whole is mixed with enough water to make a paste and the paste applied to the surface to be united.—*R. B. Wailes.*

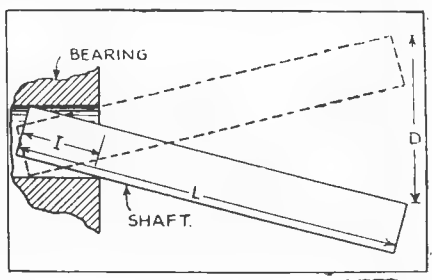
A Handy Post Bench



TWO short timbers bolted to an upright post make a bench for the work vise in the automobile repair shop. As the regular bench is usually placed at some distance from the car floor, this little bench is found to be particularly useful when taking up connecting rods, and other work needing the use of a vise. Such a mounting can also be used for emery wheels, bench drills and other small power tools.—*A. C. Wilson.*

Measuring Clearance Without a Micrometer

MEASURE distances I and L in inches, then find distance D by wiggling the shaft. The clearance between the shaft and the bearing will be found by multiplying D by I, and dividing the product by twice the length of L.—*W. F. Schaphorst, M. E.*



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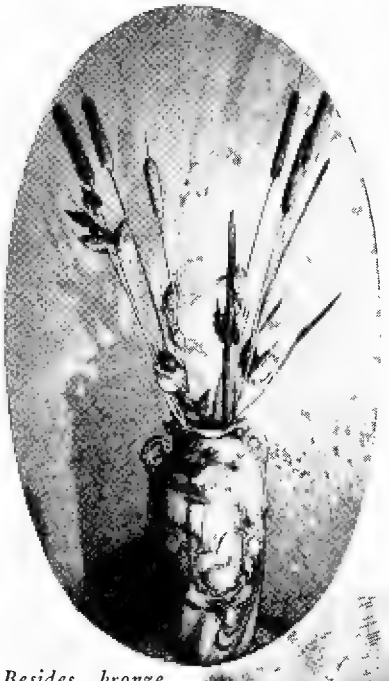
How-To-Make-It

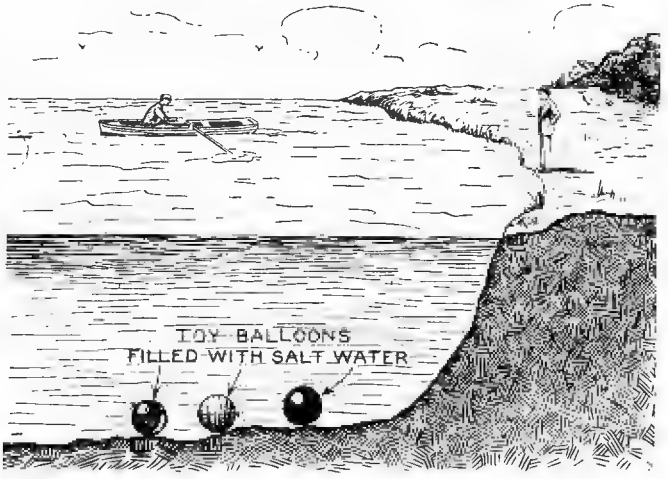


Gilding the Lily!

DRIED plants may be gilded to make decorations different from the ordinary. The plants are given a coat of shellac. Powdered colors and bronzes are used. They are either sprinkled over the "tacky" shellacked surface or they are mixed with liquids and applied with a brush.—*W. E Burton.*

Besides bronze and gilding powders, various colored powders may be used to produce many beautiful effects. Flowers treated in this way will last indefinitely.

Toy Balloons Show Pond Leaks



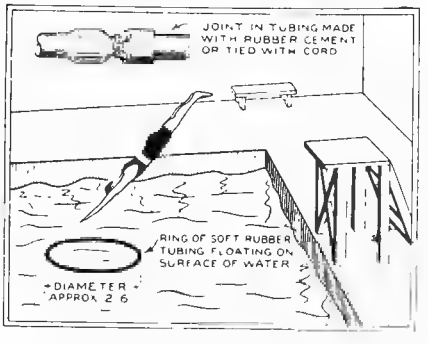
The diagram above shows how the balloons filled with salt water sink to the bottom of the lake where they are sensitive to currents.

SMALL rubber balloons filled with salt water until they are ten inches in diameter will help find leaks in artificial lakes. The balloons are dropped into the water and when they reach the lake bottom they will respond readily to currents. They will follow these currents until they come to the leak, and stop directly over it. Red and yellow balloons having some design printed on them in contrasting colors are most easily seen from the surface. After the leaks are found by this method, they may be plugged with willow mats and dirt.—*J. O. Hutchings.*

House Numbers That Harmonize

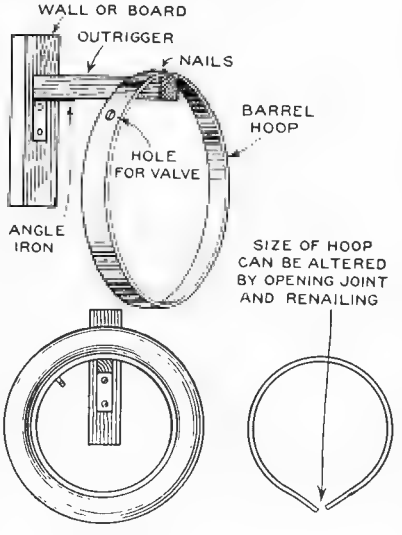
HERE is a simple method of making metal house numbers harmonize with the exterior color scheme of the home. Clean and slightly oil the insides (backs) of the numbers, which are concave. Mix some ordinary flexible collodion, obtainable at a drug store, with a suitable coloring matter such as dry pigment. Pour the liquid into the backs of the letters, and allow to dry for a day; then refill and allow another day of drying.—*K. B. M.*

Loop for Diving Practice


JOINT IN TUBING MADE WITH RUBBER CEMENT OR TIED WITH CORD
RING OF SOFT RUBBER TUBING FLOATING ON SURFACE OF WATER
DIAMETER APPROX. 2 6

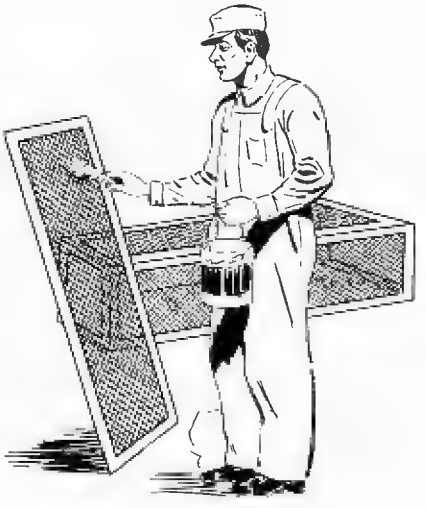
A LOOP of soft rubber tubing which floats on the surface of the water makes an excellent aid for one who wishes to develop accuracy and form in diving. When in use, the object is to dive through without dragging it below the surface of the water, or still better, without touching it. It is remarkable how quickly the diver learns to straighten out his body when using the loop. The rapid improvement results because there is a definite objective.—*P. R. Rannie.*

Rack for Repaired Inner Tubes



SMOOTH barrel hooks may be used as racks for repaired inner tubes. They not only keep the tube in good condition until the customer calls, but any deflation is instantly noticed and the tube can then be immediately investigated for additional leaks. A hole is bored in the hook for the tire valve. An outrigger a foot or so long is nailed to the underside of the hook and the other end attached to the wall so it projects out horizontally. This will prove worth while.—*L. B. Robbins.*

Making "Ultra-Violet" Windows



SUNLIGHT passes through glass windows readily, but the ultra-violet rays of the spectrum are filtered out. Squares of ordinary copper screening can be turned into windows that will admit the health-giving rays by painting them with a clear celluloid varnish. The little square holes in the screen will fill with the varnish and dry quickly.—*K. B. Murray.*

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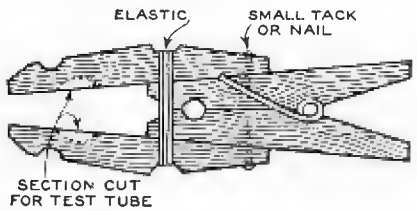
More Valuable How-To-Make-It Ideas

Mounting Photos With Heat

MOUNTING tissue for photographs can be made by dipping tissue paper in a solution of ten ounces of denatured alcohol, to which five ounces of light shellac and one ounce of Canada balsam are added. The prints are mounted with this tissue by pressing a hot iron over them. Prints mounted by this method remain flat on the mount without curling.—*K. B. Murray.*

A Simple Test-Tube Holder

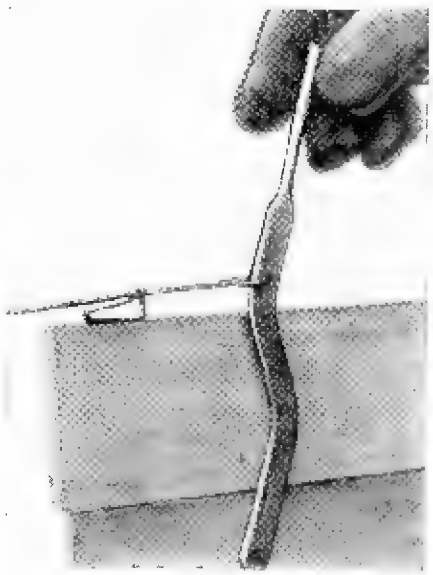


The construction of the test tube holder is shown in the drawing above.

TWO ordinary spring clothes pins are used in constructing this simple test-tube holder. The spring is taken off one of the holders and the two pieces of wood that are left are fastened to the end of the remaining clothes pin with a rubber band. Small tacks or nails are used to keep these pieces from slipping. A small section is cut out so that a good grip may be made on the round walls of the test tube.—*A. Jue.*

Neat Throttle Extension

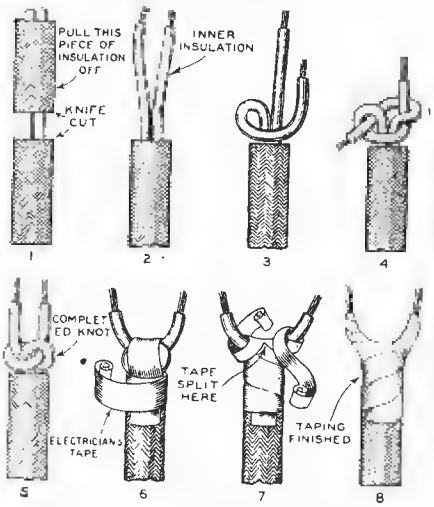
A THROTTLE extension and latch made of odd parts is shown above. The lever is simply an old door-latch lever off a junked automobile. The rod is a heavy piece of wire notched by laying it over a nail on a hard block and striking it with a hammer. The catch or latch is made of the key spring



Showing how the throttle extension is mounted on the rig framing.

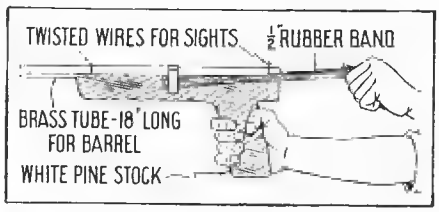
and frame from an old light socket. Holes are already in it for small wood screws or nails. The little affair was put on a home-made wood saw outfit to get better control when tough pieces were encountered.—*F. W. Bentley, Jr.*

Do You Connect Lamp Cord Properly?



THE above drawing shows clearly how the ends of lamp cords should be prepared for attachment to a plug or other connection. This is the proper method commonly used by electricians. With this arrangement a good, solid connection is made.—*L. B. Robbins.*

A Rifle to Shoot Arrows!

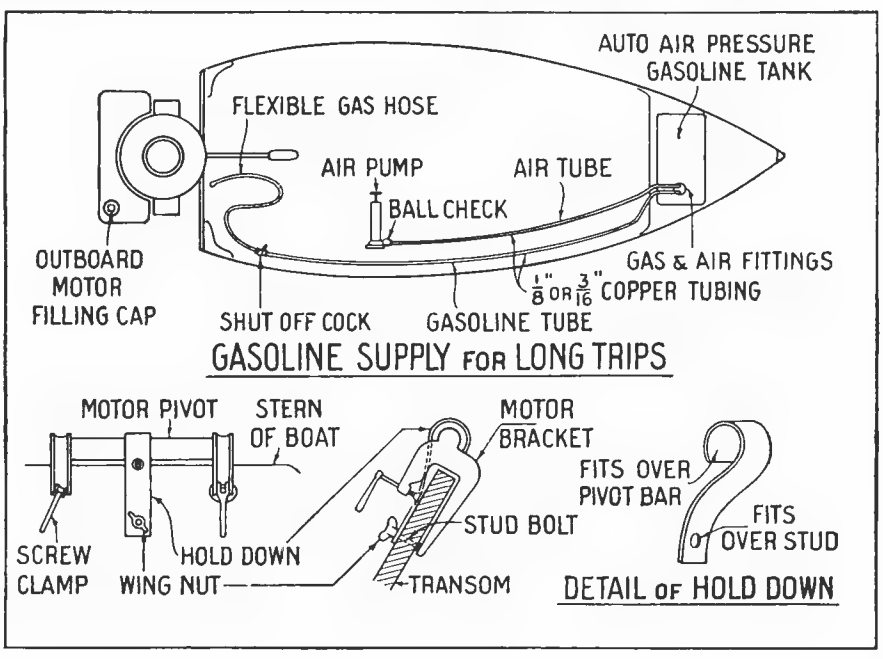


The method of using this home-made arrow rifle is shown above.

THE drawing above shows how an arrow rifle can be made which is a cross between a bow and a gun. It has all the speed and hitting power of the bow, combined with accuracy that approaches that of a rifle. Much fun can be had with such a rifle.—*D. R. Van Horn.*

How to Improve Your Outboard Boat

AN outboard boat may be equipped with an auxiliary gas tank so that long trips can be taken without going ashore for gasoline. An old gasoline tank from a discarded automobile is fastened in the bow of the boat; two copper tubes are run back to the stern. They should be fastened securely to prevent twisting. A shut-off cock is fastened to the end of the gasoline tube and a piece of flexible gas hose



attached thereto. On the end of the air tube a ball-check valve is fastened and an air pump is attached to this. By giving a few strokes on the pump the air pressure in the tank will force the gasoline back through the pipe. Then the motor tank can be quickly filled while the engine is running.

The constructional details of a hold-down for the outboard motor is shown in the lower part. This will prevent loss of the outboard motor in rough weather.—*L. B. Robbins.*

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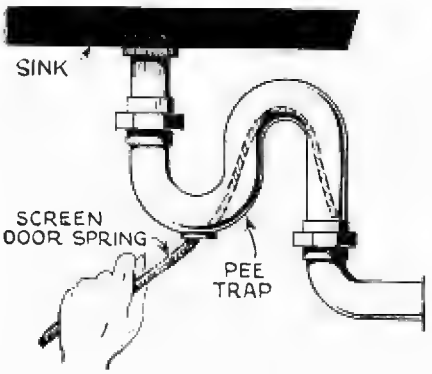
WRINKLES *and* RECIPES

Screen Door Spring Serves as Plumber's Snake

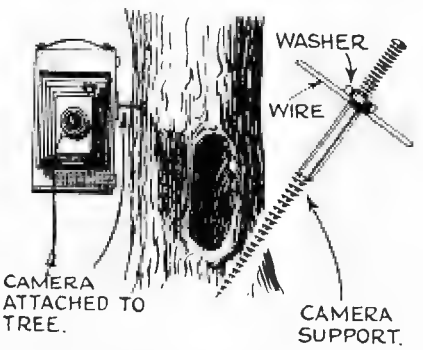


A SCREEN door spring will make an excellent plumber's snake to loosen obstructions in pee traps of the kitchen sink. Having a length of about three feet and being very pliable yet semi-rigid, the coiled spring can be led around the pipe bends very easily. Using this improvised snake, it will be unnecessary to call in a plumber when the trap is clogged up.—*R. Wailes.*

Rapid Method of Filtering

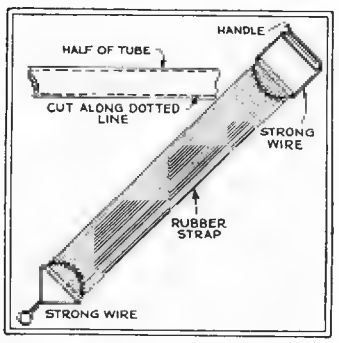
Filtering solutions through paper is a slow process even with a good filtering funnel. The filter paper, as soon as saturated clings close to the surface of the funnel, and holds back the solution. Also, this reduces the available filtering surface of the paper. A common glass funnel can be used as a filter funnel, or the fluted filter funnel can be improved by the following method. Take a piece of wire screen such as used in screen doors, form it into a cone that will fit loosely inside of the funnel. Then fold the filter paper in the usual manner and place it inside of the screen cone. This method will greatly speed up the filtering process, as it allows the liquid to flow through paper and down the inside of the funnel between the screen cone and the inner surface of the funnel. This method also allows the full surface of the paper to do its share of the work. If filtering a solution that is corrosive to metal, give the screen cone a good coat of acid resistant paint, or lacquer.—*Prof. W. D. Hoppie.*

One-Minute Camera Support



A DEVICE which, in many instances, will take the place of a tripod, can be made of a brass wood screw, and can be carried in the pocket. The screw should be 3 or 4 inches long and ¼ inch in diameter. Cut off the head and thread the end about ½ inch to fit the socket of the camera. Drill a ⅛ inch hole through the metal just below the threaded part and insert a short piece of ⅛ inch wire.—*V. Johnson.*

Inner Tube Exerciser



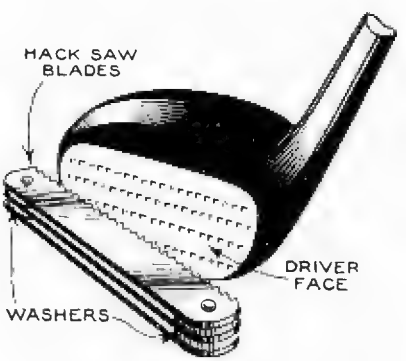
A PAIR of very good exercisers can easily be made from half an old tire tube and two handles from a lard tub. Any other handles suitable for this purpose may be used. The tube is cut along the edge as shown, thus making two uniform rubber straps. On one end a handle is placed and on the other a strong wire anchor.—*A. Deluca.*

Refinishing Scratched Varnish

Many of our radio sets and pianos have a few accidental scratches and mars on them. Here is a very simple way to touch up the blemishes so that they do not show up so bad, and if they are just a shallow scratch to cover them up entirely.

First rub the surface with wood alcohol. Rub the whole surface in a light stroking motion. If the scratch is bad, pour on quite a quantity of alcohol and rub it all over the surface. This softens the varnish, and it can be rubbed down with the alcohol soaked cloth. To finish, pour on a little furniture oil, and rub down with some fine steel wool. You will find that the white marks have disappeared, and the surface is improved a hundred per cent. This can also be used to brighten up a surface that has become dull, it adds new luster to the article.—*Laurence White.*

Reface Your Golf Clubs



HACKSAW blades can be used to advantage in refacing golf clubs which have become considerably battered through constant use. Washers are inserted between the ends of hacksaw blades to spread them apart to the desired distance. It is then a simple matter to clamp the club in a vise and saw the horizontal grooves into it, which give the golf ball its twirling motion.—*A. Jeffers.*

How to Wash Negatives

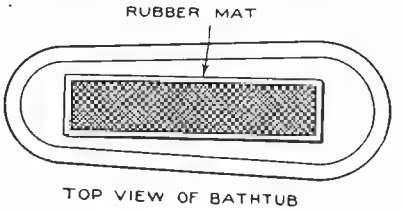
A BOARD which will be handy for washing strips of film can be made as shown. The film is fastened to the board with thumb-tacks and the board is floated in a bathtub or other container for the water. Film can be washed in this manner, without undue attention being paid to the process.—*D. R. Van Horn.*

What Camphor Can Do

A curious effect caused by the presence of the minutest quantities of oils and fats has been described by Lightfoot. Camphor, crushed between layers of papers without having been touched with the fingers, when thrown on water, rotates vigorously; but a trace of oil or fat on the surface of the water causes the rotation to cease immediately. Hence it is sufficient to touch the water with a needle which has been passed previously through the hair, which then mysteriously stops the rotation of the camphor.

This would be a good indicator for the presence of the slightest trace of fat or oil on the surface of the water, as the small particles would not rotate if either were present.—*F. P. Pioutkowski.*

"Anti-Slip" For Bathtubs



AN ordinary strip of rubber stair matting makes a fine anti-slip for the bottom of a bathtub.—*F. Moore.*

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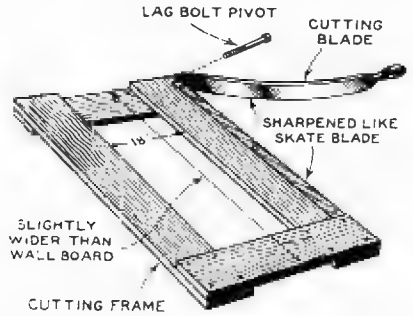
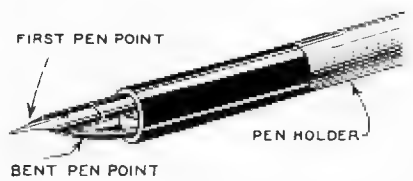
These Wrinkles and Recipes May Save You Time

Time Saving Wall Board Cutter



A WALL board cutter which will speed up the trimming of sheets of wall board in the course of fitting can be constructed from a few smooth planks and a cutting bar made from a piece of flat steel. The cutting knife is fashioned from a second piece of steel as indicated.—*L. B. Robbins.*

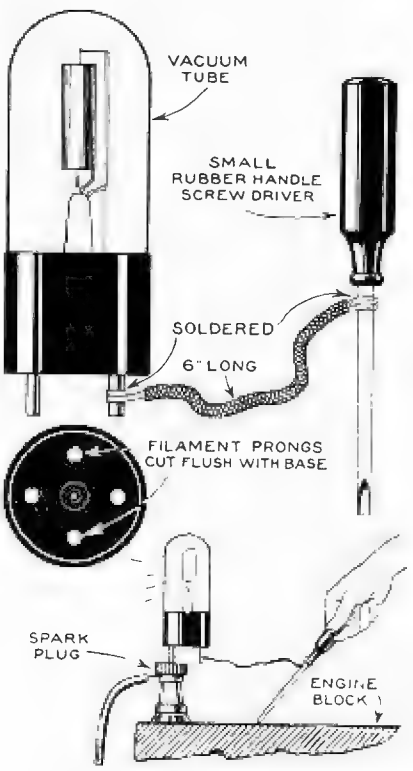
Dipless Pen



A DIPLESS pen can be constructed with an ordinary holder and two pen points. The extra point is bent and placed in the holder so that it just touches the underside of the regular point.—*K. B. Murray.*

Spark Plug Tester

AN old radio tube, a piece of wire, and a small rubber handled screwdriver make a good spark plug tester. A glowing spark in the vacuum tube will indicate that the plug is working properly.—*D. Switzer.*



Care of Tools

I recently discovered that a pair of pliers I use in jewelry work which had lain idle for a time were quite rusty and did not work as easy as they should. By experimenting a little I found that by dipping them in ordinary ammonia for a few minutes loosened the dirt and rust and made them work as good as ever. This method can be employed with shears and other tools as well.—*Leslie F. Carpenter.*

Making a Candle Burn Slowly

A candle can be burned more slowly if powdered sodium chloride is put on the candle. Put it on after the candle has reached the black part of the wick. It will give a dull light lasting for many hours.—*Benjamin Heller.*

Inlaid Engraving

A novel departure from ordinary methods of lettering and engraving name-plates for chests, doors, etc., is secured by "inlaid engraving," which is inexpensive and easily done. The plate is coated front and back with wax, and the lettering scratched through the wax to the metal with a sharp instrument. Placed in dilute nitric acid, the lines are quickly etched. The plate is then removed from the acid, rinsed and placed in an electric plating bath. As the wax still covers the background, only the etched portions are plated. When the lines have become filled with the plated metal the wax is removed and the plate polished. Good contrast can be secured by using a white metal for the plate, and a copper plating bath.—*K. B. Murray.*

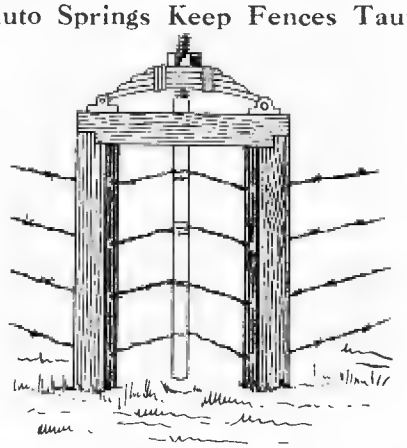
Initialing Articles of Ivory

Ivory objects, such as combs, handles, etc., may be very easily and inexpensively lettered with names, initials or designs by the following method: With a lead pencil outline the initials or design directly on the ivory, and fill in the background (all of the ivory not outlined in pencil) with quick-drying varnish on a pointed brush. When the varnish is dry the lettering must be covered by, or dipped into, a concentrated solution of silver nitrate and distilled water. After some hours the lettering will have turned a deep yellow or orange. Remove from the silver solution, get rid of the varnish with alcohol and expose the ivory to bright sunlight until the lettering assumes a dark color. It may then be polished, when the initials will assume a bright silver that will last a lifetime.—*K. B. Murray.*

Cleaning White Gloves

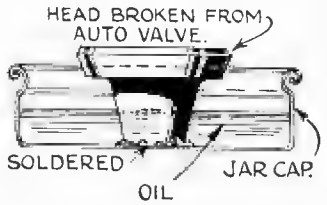
White gloves are unlovely unless spotless. Frequent home-cleanings usually leave them yellowed, but if a teaspoon of powdered borax is added to the gasoline in which you clean them, the gloves will emerge with a pristine whiteness that makes it a pleasure to wear them.—*Eva L. Dunbar.*

Auto Springs Keep Fences Taut



A DISCARDED automobile spring affords an effective means of taking the sag out of wire fences. The spring is set up as shown in the drawing. The natural tension of the spring keeps the fence taut.—*A. Jeffers.*

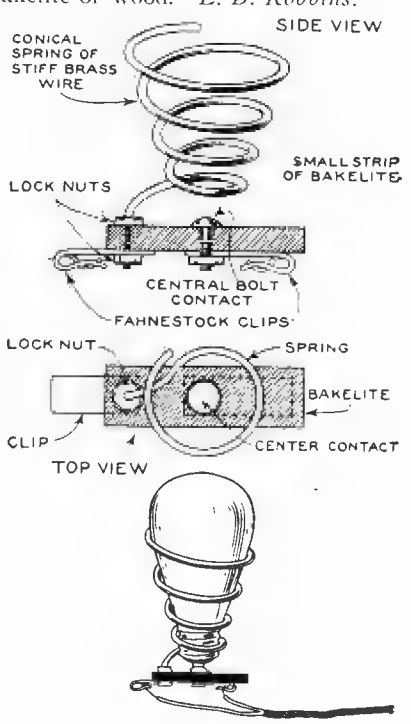
Protecting Foodstuffs From Ants



RESTS for the legs of a refrigerator which will prevent ants from getting into the foodstuff can be made as shown in the illustration above. This is an effective means of keeping ants away.—*R. Le Compte.*

Emergency Electric Light Socket

HERE is an electric light socket that can be made in a short time from odds and ends about the shop. It will serve admirably in an emergency. The base may be constructed either from bakelite or wood.—*L. B. Robbins.*



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Readers' Opinions and Comments Will Be Welcomed by the Editors

What Our

Distance No Barrier

Editor, SCIENCE AND INVENTION:

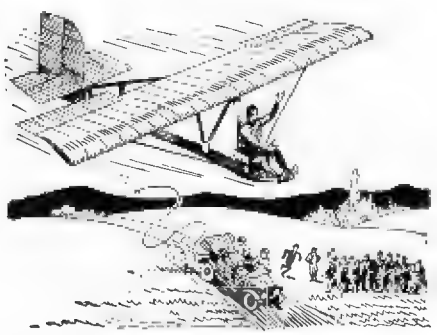
The writer has, for some little time now, been a constant reader of your excellent magazine and can truthfully say it has afforded much interesting and useful information. Distance is no barrier for this little magazine which I choose to call "The best there is in Scientific Periodicals." ROXY MIDDLETON,
Consulting Acoustic Engineer,
Sydney, Australia.

(Glad you like it and trust that as time goes along you will find it even more interesting than it is today.—EDITOR.)

Glider Made From Our Plans Is Good

Editor, SCIENCE AND INVENTION:

We have successfully completed the Primary Training Glider, the plans for which appeared in your magazine. We purchased the plans from the author of



your article, but found the drawings and text as presented in SCIENCE AND INVENTION to be much clearer to read and understand.

Here in the vicinity of Syracuse, where the terrain is very favorable for enjoying this sport, interest is just beginning to be manifested by the public. We were given four columns of publicity in the leading local paper (Syracuse *Post-Standard*) with two large photos showing the ship in construction.

Any of your readers wishing to build a glider and in doubt as to the practicability of being able to do so at home may be referred to us, as we have been very successful and we appreciate your efforts in devoting your pages to an article of this kind.

We might suggest that you procure the plans and specifications of a secondary training type or even a soaring type of proven merit.

We look forward to every issue of your magazine and are waiting for the new glider information you promised in the near future. G. W. REYNOLDS,
Syracuse, N. Y.

(Every effort has been made on the part of the editors to present gliders which are thoroughly safe, which will give the satisfactory service and the plans of which are easily read and understood.

We wish you much success with your glider and trust that you will build and enjoy many more of them.—EDITOR.)

Prophetic Dreams

Editor, SCIENCE AND INVENTION:

In the August issue of SCIENCE AND INVENTION I read an article about dreams and thought you might be able to solve a little mystery about a dream my grandfather had when he was prospecting for gold in California.

He dreamed that he saw a scene where he was digging and he unearthed a little gold heart about the size of a man's thumbnail, with a little rough place on one side.

He made a notation of the dream and, when he had time, he dug in that particular place indicated by his dream and found a little gold heart very nearly like the one of which he dreamt. R. JOHNSTON,
Scio, Oregon.

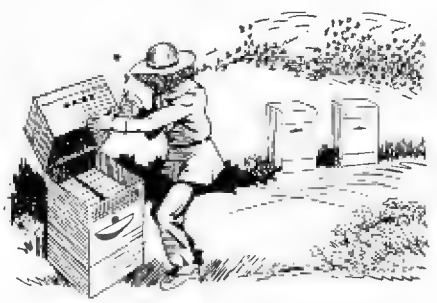
(Might this not have been purely a case of coincidence. You first state that your grandfather was prospecting. It is not at all unusual to unearth small pieces of gold which may take on various forms and shapes. We have seen heart-shaped nuggets, monkey-shaped nuggets and even nuggets which resembled the human face or form. If this is the only case of a prophetic dream, it does not seem that the prophecies terminate successfully. In your grandfather's life he must have had countless other dreams besides the one of which you write.—EDITOR.)

Hidden Vitamines in Honey?

Editor, SCIENCE AND INVENTION:

According to the holy book of the Mohammedans (the Koran), I hold the belief that there are some hidden vitamines in honey.

In the Koran it is said that honey has a great healing quality for the human body.



On page 92 of your most interesting magazine (May issue) you published "It is said the bee's cell is built according to mathematical precepts." If the cell is so built, why may not the honey itself be composed of the highest chemical products?

I wonder why the scientists of America close their eyes to the hidden secrets in the Koran. The revelations in the Koran are many; electricity is mentioned in it and the airplane (the flying rug of King Solomon), etc.

Will the scientists of today discover the healing substances of honey?
H. ABD-EL-MOTTALIB,
Alexandria, Egypt.

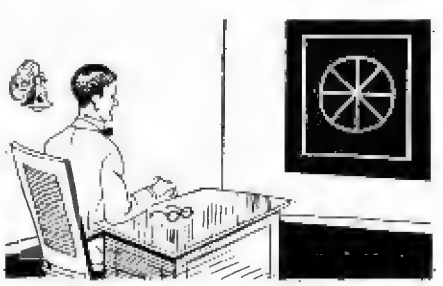
(All religious works contain statements which by inference are applicable to our most modern inventions. But the flying rug of King Solomon is no more like the airplane of today or even the first airplane than our modern motorcycles are like the winged feet of Mercury.

The use of honey is of great antiquity and extends over nearly every temperate country of the globe. At one time it was an article of great luxury because the bees are less provident and honey is not so regularly collected in tropical countries. Subsequently it was employed as a food, later on medicinally and is today even used for this purpose, but it has no medical value whatever beyond that of its sugar or syrup. It is used as a vehicle in medicine and is still considered official in five preparations in the United States Pharmacopœia and the National Formulary probably because of its taste and because of traditions but not because of a medicinal value, which it does not possess.—EDITOR.)

Eye Exercises

Editor, SCIENCE AND INVENTION:

I see many articles of medical interest discussed in your magazine and wish to ask a question along that line.



There are companies that advertise systems of *eye training* to enable a person to strengthen his eyes and discard his glasses. Are these advertisements reliable?
C. F. W.,
Greenville, Ill.

(While eye exercises may have some value in the individual whose muscles are undergoing development and who is quite young, it is very questionable if these exercises will have any effect on a person 25 years of age or older. It does not seem

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Readers Think

Questions and Discussions of General Scientific Interest

possible that exercising the eye for ten minutes a day can compensate for the other movements of the eyeball not in accordance with the exercise chart and carried on for a period of from 14 to 18 hours (the rest of the day).—EDITOR.)

He Makes Us Blush!

Editor, SCIENCE AND INVENTION:

I am very much interested in all new inventions and discoveries, not from a speculative but from a purely scientific standpoint.

There can be no question about SCIENCE AND INVENTION being one of the best publications of its kind on the market today, but for some unknown reason it is not appreciated. I know from personal experience that no place on earth has such a storehouse of comprehensible scientific knowledge so easily understood by the unfortunate layman who is without a college education as one can find in SCIENCE AND INVENTION. We might mention many places where one can acquire a very extensive education in science, but these places are out of the question for the layman and are not worth the space it would take to tell of them here.

I could cite many occurrences which would be very interesting and would easily prove the merits of SCIENCE AND INVENTION.

M. A. MCRAE, E. E.,
Chicago, Ill.

(We thank you very much for your compliments, but are they not a bit too strong? They make us blush.—EDITOR.)

What He Likes

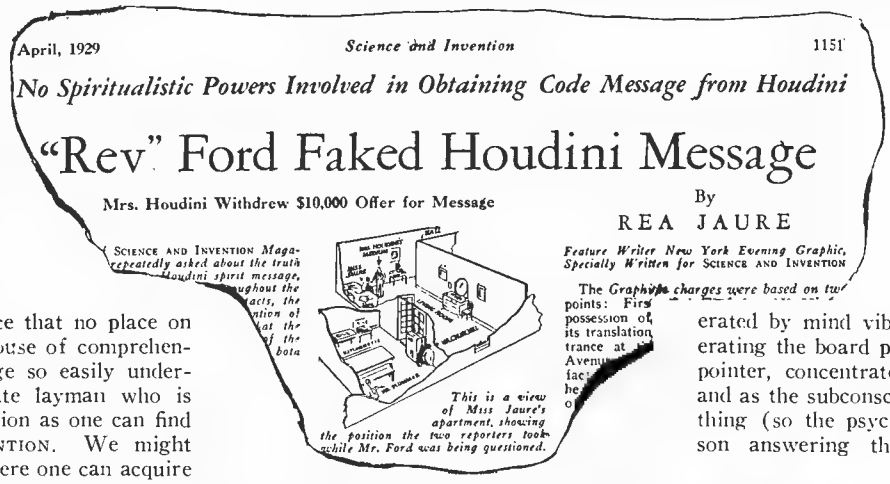
Editor, SCIENCE AND INVENTION:

1—Discontinue "Scientific Humor."

2—Have follow-up articles on interesting subjects warranting them. Such as further developments in that proposed system of house heating—using heat of compressed external air to warm house, etc., and publish results of Alpine experiments to draw static electricity from air by large metallic meshes.

3—More pure science and less financial news and scientific fiction. There are enough magazines now devoted to those subjects. More of Dr. Bade, Dr. Menzel and Dr. Ditmars. Continue your "determination of sex" articles. "Is a college education worth while?" in your present number is entirely out of place in a scientific journal. Leave that type of article to the *American.* PAUL W. PRINDLE,
New York City.

(We are afraid that a great many readers will disagree with you when it comes to discontinuing "Scientific Humor." We published a feature on Alpine atmospheric electricity experiments.—EDITOR.)



April, 1929 *Science and Invention* 1151

No Spiritualistic Powers Involved in Obtaining Code Message from Houdini

"Rev" Ford Faked Houdini Message

Mrs. Houdini Withdrew $10,000 Offer for Message

By REA JAURE

Feature Writer New York Evening Graphic, Specially Written for SCIENCE AND INVENTION

SCIENCE AND INVENTION *Maga- repeatedly asked about the truth Houdini spirit message, ughout the acts, the ntion of at the of the bota*

The *Graphic* charges were based on two points: First possession of its translation trance at Aven fact he o

This is a view of Miss Jaure's apartment, showing the position the two reporters took while Mr. Ford was being questioned.

The Houdini Code

Editor, SCIENCE AND INVENTION:

I clipped from the New Orleans *Times-Picayune,* a few days ago, an article concerning the delivery of the Houdini Code, which is self-explanatory.

Would you mind advising me if the Rev. Arthur Ford, mentioned, complied in every respect with the rules of the test as laid down by Mr. Houdini? I assume, of course, that he did not, since the reward mentioned was not tendered him, but wherein did he fail?

May I ask what would you consider absolute proof of the continuity of life, and if you are interested in determining this, would it not be well to work to the end of proving or disproving such a program as you might outline? I have been unable to obtain such an expression from others, who at least ought to be in splendid position to give an intelligent idea along these lines.

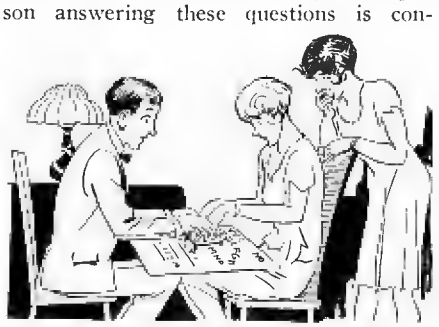
I would immensely appreciate your views on the subject. H. S. GIBBES,
Savannah, Georgia.

(An entire exposé of the way Rev. Ford delivered the Houdini message was presented in the April, 1929, issue of SCIENCE AND INVENTION magazine. Several months before this message was delivered, the original prize offered by Mrs. Houdini for the code was retracted. The code was then given and, as the article indicates, Mr. Ford admitted to perpetrating this hoax for publicity purposes. We would refer you to that issue at your local public library for further information concerning the details and how data were obtained. Our offers of $21,000.00 have been repeatedly listed in this magazine and are also found in the publication called "Houdini's Spirit Exposés and Dunninger's Psychical Investigations" in their entirety.—EDITOR.)

We Should Be Spiritualists!

Editor, SCIENCE AND INVENTION:

Your idea of trying to expose spiritualism is very interesting. In a practical way it is a very good idea, but in a theoretical way it is not. I should think that if you would care to investigate this subject you could do so from the spiritual aspects and not from the attitude of a skeptic. (Like attracts like.) The Ouija board is operated by mind vibration. The people operating the board place their fingers on the pointer, concentrate on a certain question and as the subconscious mind knows everything (so the psychologists say), the person answering these questions is consciously unaware that he answered the question himself subconsciously. The same is true of the spiritualists who answered unopened letters. That's the only way it can be done.



Here's hoping you will have better light on this subject later on.

FRANCIS MODRICKER, JR.,
Winthrop, Mass.

(If anyone was capable of swimming across a river one-half mile wide, he would be able to do this regardless of whether spectators believed he could or whether they were skeptical. The spiritualist demonstrates purely physical affects. To these he attributes a supernatural power or a power not possessed by a man of average intelligence.

When we have a test séance, our mind is entirely open to conviction. We merely sit and view the procedure. But is it necessary for us to hold that a man is superhuman merely because he says so? Can we not ask for proof? Referring to the Slater challenge, reports of which were published in a recent issue, and assuming that we were entirely skeptical, Mr. Slater found no difficulty in giving messages to others in the room. It is claimed that when a skeptic sits in the circle no messages are possible. Why couldn't Mr. Slater do for the

(*Continued on page* 642)

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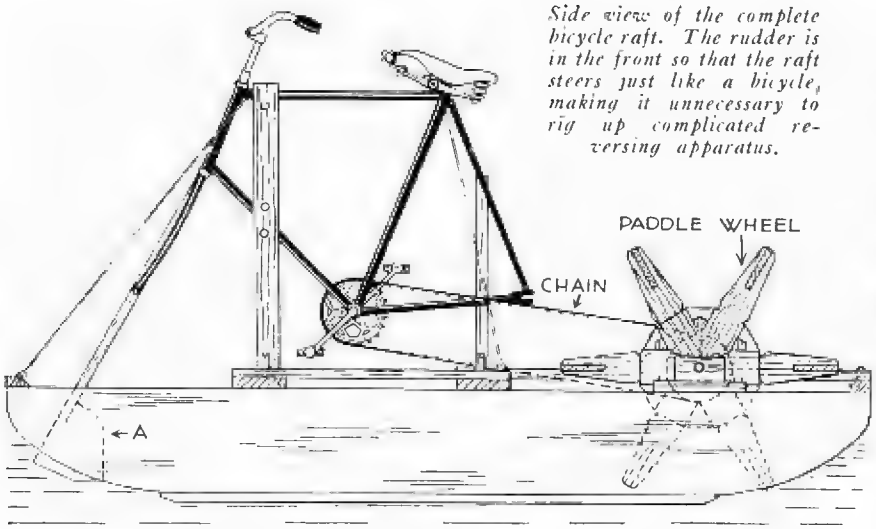
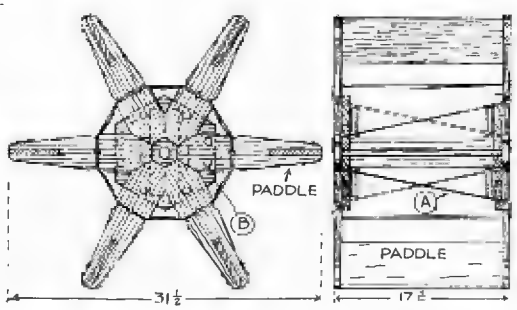


Side view of the complete bicycle raft. The rudder is in the front so that the raft steers just like a bicycle, making it unnecessary to rig up complicated reversing apparatus.

Bicycling over the water becomes as easy as over the land, and there is no traffic problem.

How to Build a *BICYCLE* CATAMARAN

$10.00 will be paid for each "old bicycle" idea accepted and published.

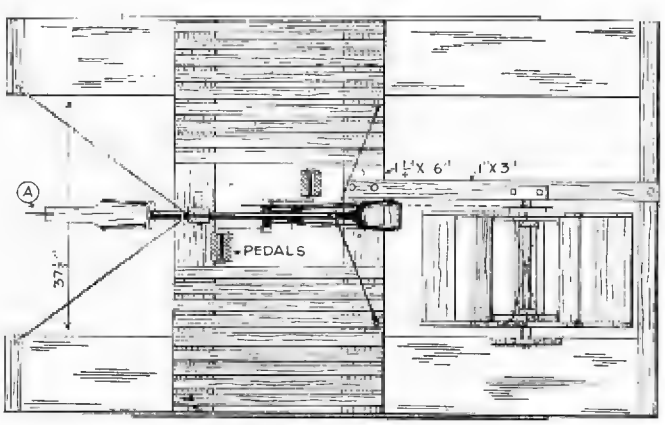


The paddle wheel is constructed as shown. The guy wires allow for strong, rigid construction with extreme lightness. The blades are connected together at B.

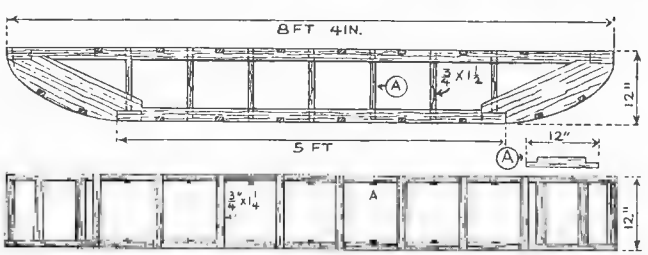
PEDALING across the English Channel on a bicycle raft is one of the newest methods of crossing this choppy channel. This feat was accomplished recently by a Frenchman who crossed from Calais to Dover in five hours and fifty-seven seconds despite high seas and strong contrary winds. This opens a new field to many would-be channel crossers who are better cyclists than swimmers.

A hydrocycle similar to the one used to cross the channel was described in the *Illustreret Familie-Journal*. It can be easily constructed from an old bicycle frame. The pontoons, platform, paddle-wheel, and other parts are constructed of wood. Any strong, straight wood can be used.

The sides for the pontoons may be constructed first. The upper and lower beams are made of 1″ × 2″ stock. A paper pattern can be cut out for the rounded end pieces and the eight pieces can be made at one time so that their curves will true up and be uniform. The sides and top of each pontoon are covered with half-inch boards. The straight part of the bottom is covered with one-inch planking beveled on the end as shown in the illustration above. The curved part is covered with galvanized sheet iron. Brass screws should be used for fastening the parts together. White lead is used as caulking material, it being necessary where the sheet metal is joined to the wood. Each pontoon should be painted with regular deck paint. About three coats of paint will be necessary.



The top view shows that the paddle wheel is placed slightly to one side to allow the sprocket chain to be connected to it.



The framework of the pontoons is made and then covered with wood; this makes for light construction.

The platform is next made. The two main beams are 1¼″ × 6″ stock, and 61″ long. The slats are of 1″ × 2″ stock and about three feet long; the length will depend on the size of the bicycle frame. The platform, when completed, is fastened to the pontoons, care being taken to get the pontoons parallel to each other. The cross beam in the rear is next fastened on. It is of 1¼″ × 8″ stock, as is the support for the paddle wheel.

The size of the beams for supporting the bicycle frame will depend largely on the type of the frame used. The same general design should be followed. After the frame is mounted, the guy wires should be put in place to make it rigid. The guys should be of galvanized iron wire and should be anchored with galvanized iron eyes.

The rudder is simple and easy to construct. The rod can be made from a broomstick, to which the rudder blade, made from a thin piece of hard wood, is attached.

Making the paddle wheel and mounting it on the raft will be the most difficult part of the construction. Care should be taken to have the wheel well balanced and the different parts should fit together as accurately as possible. The octagonal center-pieces are made of one-inch oak. A support of the same wood is fastened across grain to prevent splitting. Care should be taken in drilling the holes that they are in the center and that they go through straight. The twelve spokes are also made of one-inch oak. A paper pattern is cut out for these and they should all be cut out together. The spokes are fastened to the center board with galvanized bolts. The paddles are made of half-inch oak 5″ wide and 17½″ long. Copper (*Continued on page 642*)

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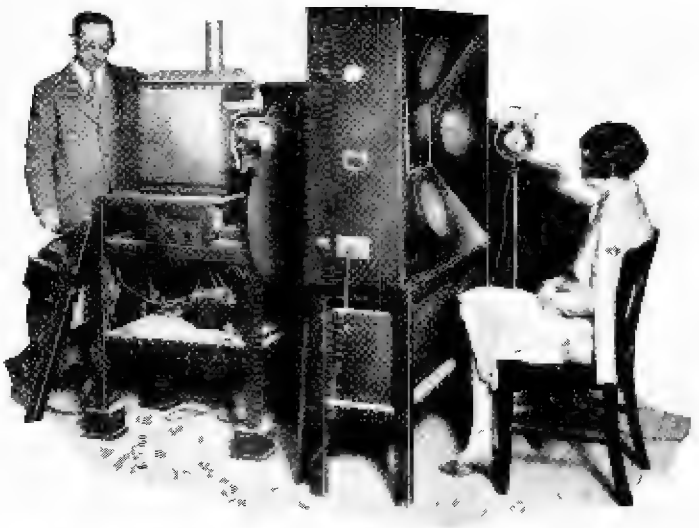
Invisible Ray Transmits Pictures

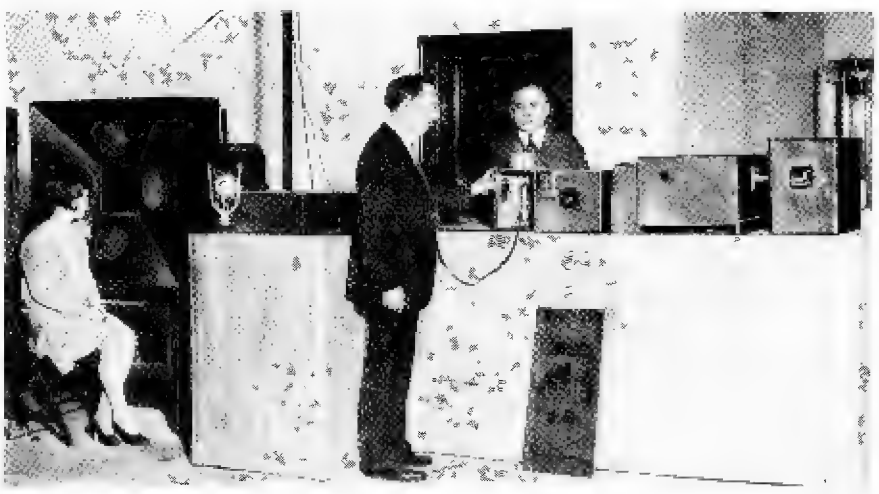
Ultra-Violet Ray Carries Television Image



Television transmitter showing person whose image is to be transmitted seated before transmitting screen. Paul A. Kober is at the rear of the apparatus noting its operation.

NEW systems of communication are constantly being sought—to relieve the congestion of existing channels and to increase the usefulness of communication apparatus. A demonstration was recently given of such a new system, which used ultra-violet light as a medium over which intelligence could be conveyed.

The ultra-violet ray exhibition made apparent immediate scientific usages and opened a wide experimental field. An example is ship-to-ship communication in time of war, when radio signals and visible light beams would be impractical. The same is true of communication between airplanes. In fact, an invisible ray, for the transmission of sound and pictures, which ray can neither be seen nor heard, has far-reaching potentialities.



The complete ultra-violet ray television apparatus as arranged for demonstration at the L. Bamberger & Co. department store in Newark. Dr. Kober is shown examining the mercury induction lamp which makes the phenomena possible.

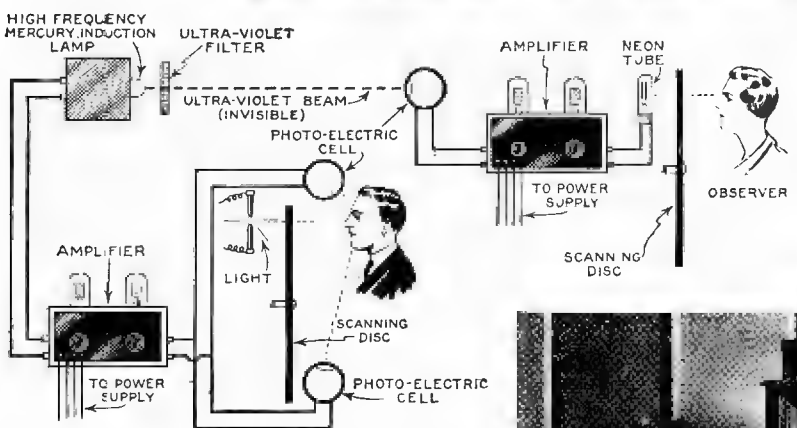
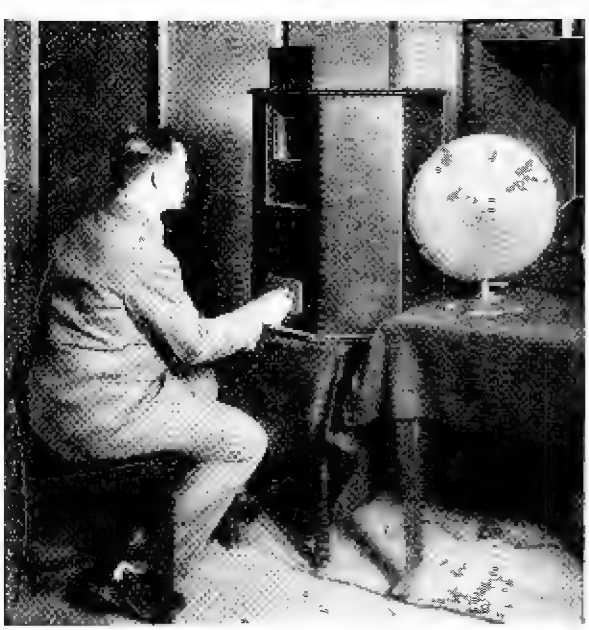


Diagram of the system used. The picture on the right shows a standard television receiver on which the pictures were received.

The demonstration was held at the L. Bamberger & Co. department store, located in Newark, New Jersey. The casual spectator observed a group of transmitting equipment at one end of the building and a receiving device at the opposite end. A bulb emitted a beam of varying colored light from the transmitting end. The light flickered and changed in intensity in accordance with the words which an official spoke into a near-by microphone connected to an apparatus operating the bulb. The bulb behaved the same way when attached to the television transmitter.

At the opposite end of the floor a loud speaker and head phones delivered the same speech; or when television was being sent, a screen showed the image of the person seated before the television transmitter. Whenever the light or rays were intercepted, reception stopped. Following this, a filter allowing ultra-violet rays to pass through was placed over the bulb. Reception of both sound and television still continued.



The feasibility of the system is due in large measure to the extraordinary qualities of the mercury induction lamp, originally developed for therapeutic work, but recently discovered to have desirable characteristics for light modulation, beyond the highest frequency needed for television. A remarkable feature of this lamp is that the radio frequency which actuates it causes it to darken and glow at least thirty million times in every second.

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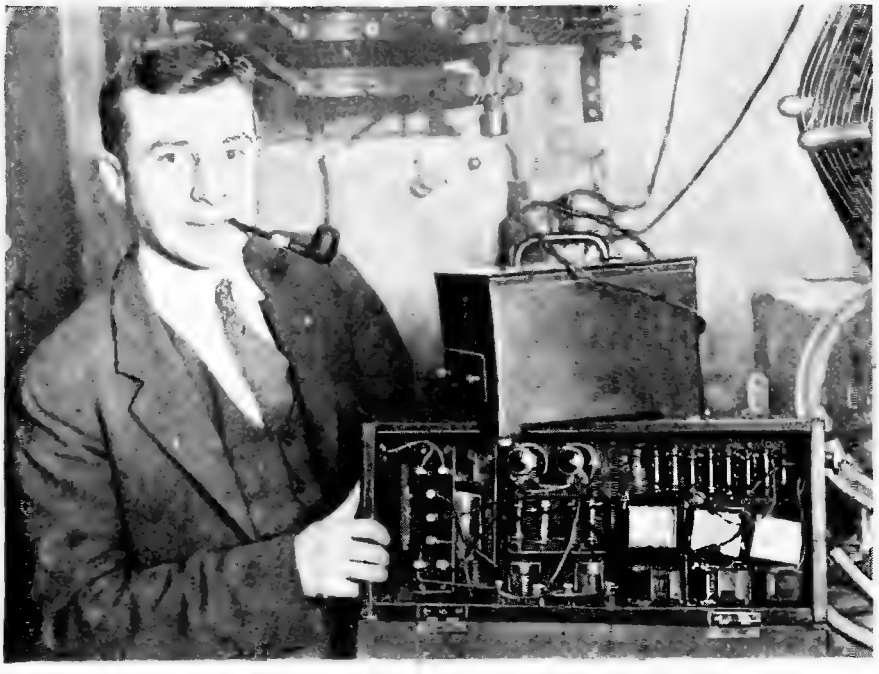
$20,000,000 for a Radio Patent!



A RADIO device that consists of little more than a few condensers, transformers, choke coils, and tubes was recently the cause of a $20,000,000 decision being won against radio manufacturers.

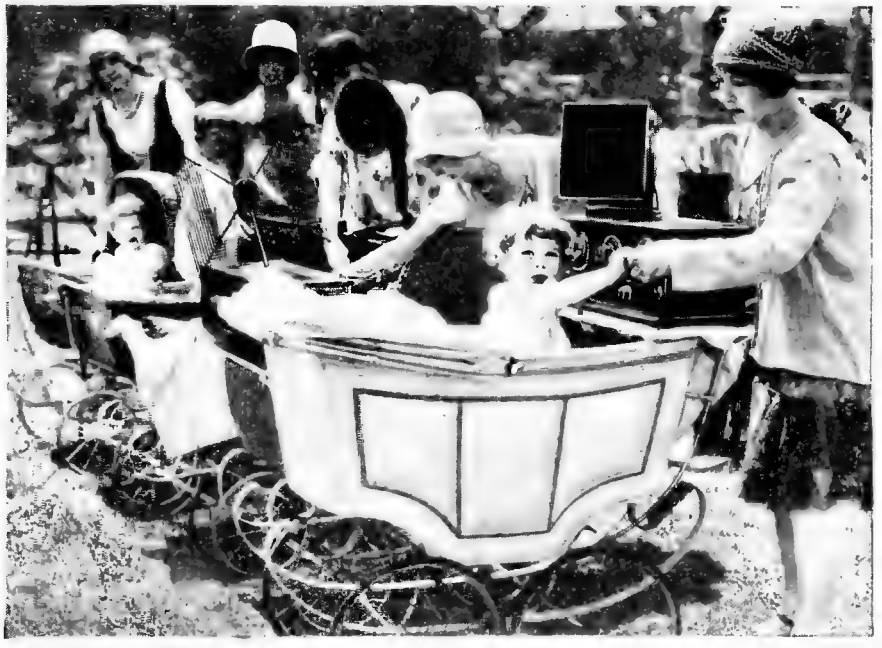
The inventor, Mr. Harry W. Houck, is shown in the photograph on the left, together with the apparatus on which he labored for a long period of time, before he finally perfected it. The device is a battery eliminator for radio sets and it makes possible the present-day all-electric radio sets. Fully 95 per cent of the radio manufacturers of this country are involved, it is said.

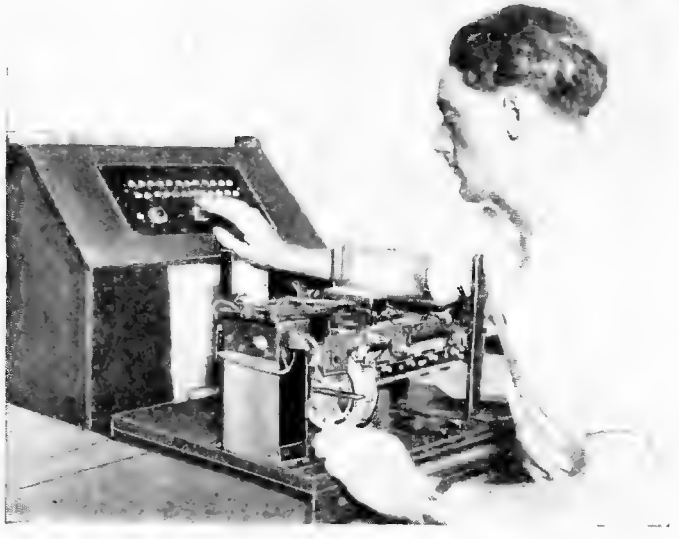
Such a decision gives hopes to many thousands of experimenters tinkering with new forms of radio apparatus. Just think of putting together a few simple radio parts and evolving a circuit worth $20,000,000! But this is not the whole story, for Mr. Houck had to spend many weary hours before he evolved this greatly needed device. The Dubilier Condenser Corporation owns the patent.

Babies Become Radio Critics

AT the recent Radio Show in Los Angeles a whole fleet of baby buggies were equipped with receiving apparatus in a novel preopening demonstration. During the show, with each buggy tuned in on a different station, various bedtime story broadcasters competed to see which one would put his particular baby to sleep first. The photograph on the right shows the lucky babies in their novel radio-equipped perambulators.

The possibilities of such an arrangement are unlimited. No longer will the mother have to croon lullabies; she need only tune in on some sleepy melodies from the local broadcasting station and be entertained while she puts baby to sleep. As the baby grows older, he may receive his elementary lessons from the same loud speaker, or mother may tune in on the latest talks on how to care for her baby—and the baby can listen in also to check up on mother's methods.





Equals Nine Men Finding Set Faults

THE photo on the left shows a new automatic testing machine which has been devised to check the performance of finished radio receivers. This device is now being used in the engineering department of the Bremer-Tully Manufacturing Company. It does the work of nine inspectors with extreme accuracy and automatically registers any defects in the receiver.

Heretofore it has been necessary to depend upon a skilled inspector for testing the accuracy of manufactured radio receivers. This had many disadvantages, as the fallible human factor was involved. With such an arrangement it was practically impossible to have uniform radio receivers, the uniformity depending upon the skill of the inspector. This new device eliminates all these disadvantages and makes it possible to turn out radio sets that are uniform in their performance as well as their construction. Besides all this, this device makes it possible to speed up production. The operation is similar to that of a telephone switchboard. The flash of each lamp indicates a certain fault.

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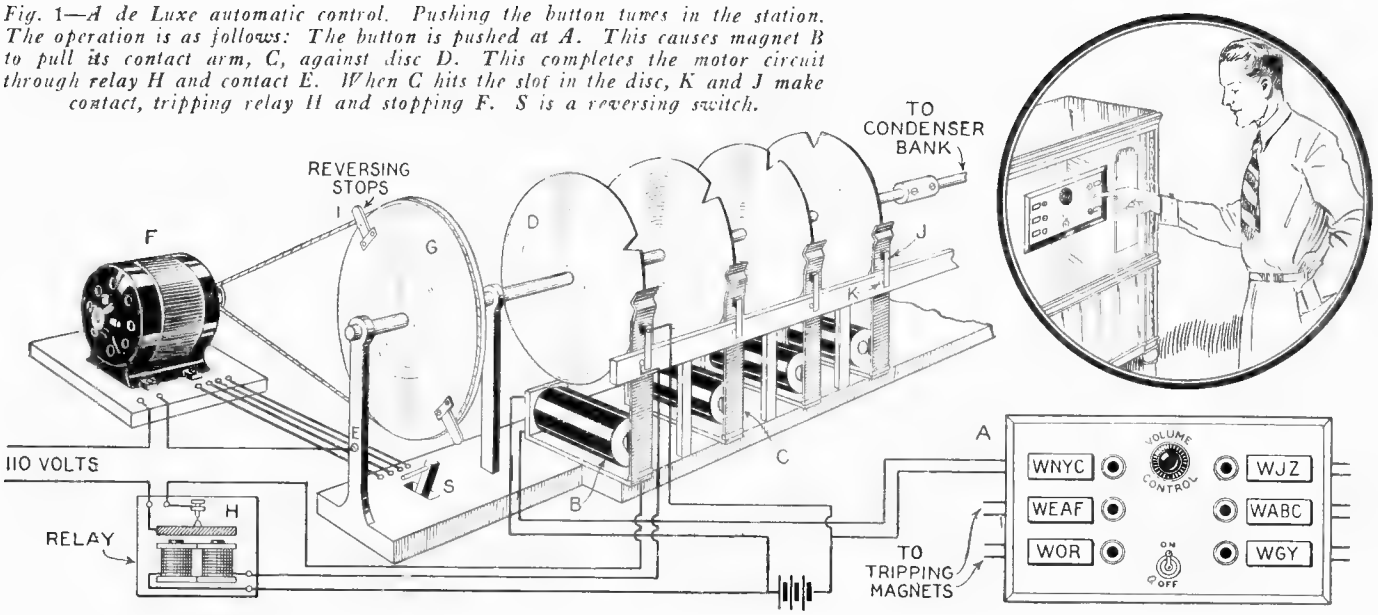
Fig. 1—A de Luxe automatic control. Pushing the button tunes in the station. The operation is as follows: The button is pushed at A. This causes magnet B to pull its contact arm, C, against disc D. This completes the motor circuit through relay H and contact E. When C hits the slot in the disc, K and J make contact, tripping relay H and stopping F. S is a reversing switch.



Construct Your Own

PUSH-BUTTON Station Selector

By Ferd. Mann, Radio Editor

THE days of radio sets that required a centipede and a mathematician for operation are gone. In their place has come the single-control receiver, and, more recently, several types of *automatic control* receivers have appeared on the market. With these arrangements, tuning in a station becomes as easy as turning on an electric light. Some of these arrangements can be operated from any part of the house by means of push buttons. So, in order to bring your set up to date, it should have automatic control. Several suggestions are shown here for the construction of automatic controls for radio receivers.

The automatic tuning device shown in Figure 1 may be operated by push buttons on the set or by remote control—the push buttons being placed on little boards in different parts of the house and wires run to them. The diagram shows how this arrangement operates. To set the discs D so that they will tune in a certain station, the station is tuned in on the regular tuning dial and then the slot on D is made to correspond with the contact point on C. When the proper position is found, the set screw on D is tightened. In the same way each disc is adjusted for a separate station. The device may be constructed with any numbers of discs.

An automatic control that may be easily constructed from odds and ends in the home shop is shown in Figure 2. This is a simple arrangement which (*Continued on page* 668)

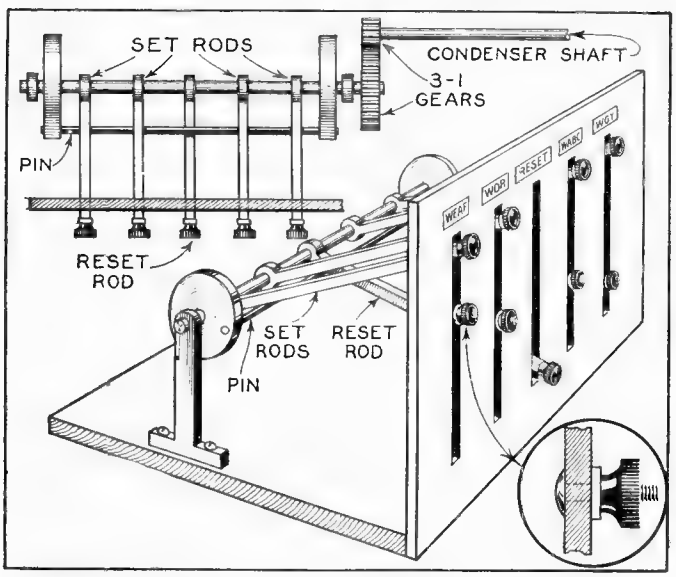


Fig. 2—A manual semi-automatic control. The station is tuned in by pushing the rod down to the stop. Retuning is accomplished by pushing up the reset and then pushing down the rod corresponding to the desired station. The 3 to 1 gears permit 180-degree tuning with a 60-degree swing of the rods.

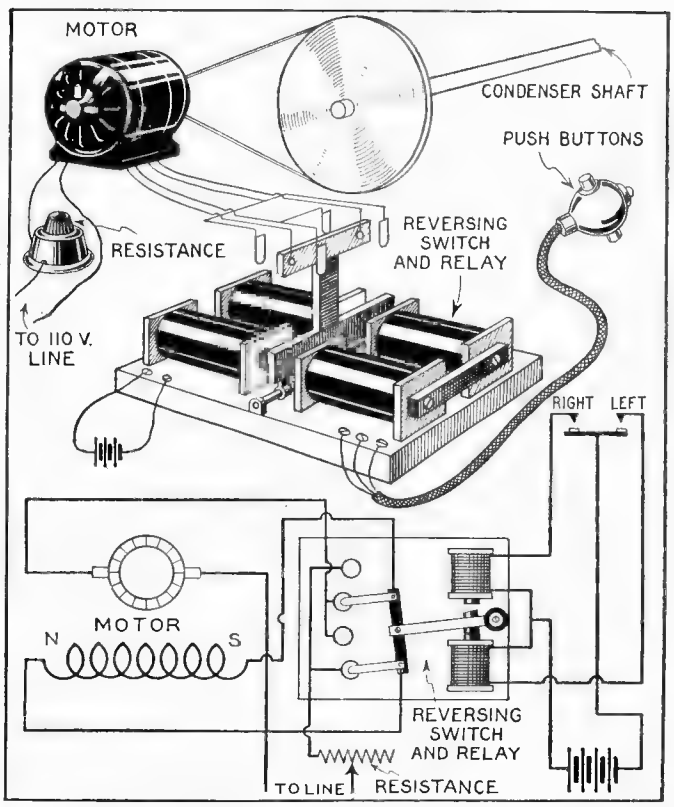


Fig. 3—A "remote control" tuning arrangement. The resistance is adjusted so that the motor revolves very slowly. Tuning is accomplished by holding the button down until the desired station is tuned in. If the station is passed over, the opposite button is pressed, which reverses the motor and brings the dial back to the station.

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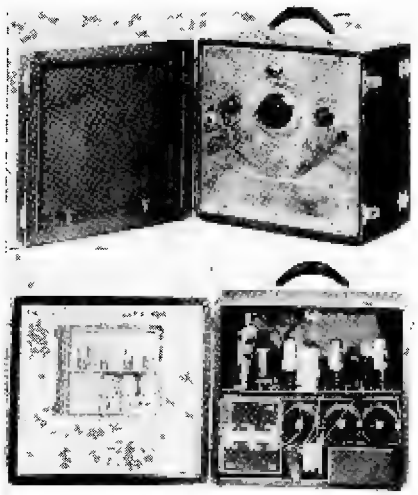
New Radio Devices



The Baird Portaradio is a radio receiver enclosed in a case that weighs no more and takes up less room than an ordinary hand-bag. It is self-contained; antenna, power supply, and loud speaker being provided.

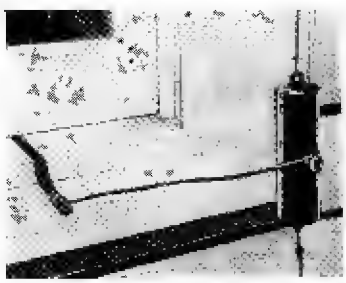
A Radio Receiver You Can Carry

A PORTABLE radio receiver that is completely self-contained has been recently put on the market. It is called the Portaradio and is manufactured by the Shortwave and Television Laboratory, of Boston, Mass. Such a set is handy to take on camping trips and automobile tours. It is quite sensitive and operates merely by opening the lid, pushing a button, and tuning in the station. It is not necessary to go to the bother of stringing up an antenna.

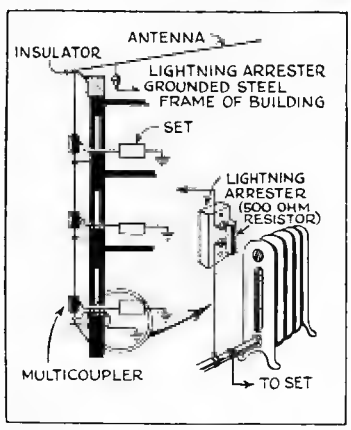
How to Use Several Sets on One Aerial

A DEVICE that will permit the use of several sets on one antenna solves the apartment house antenna problem. Such a device is the Multicoupler manufactured by the Amy, Aceves and King Co., of New York.

The multicoupler is little larger than the ordinary lightning arrester and is connected in much the same way. It makes it possible to use 2 to 15 radio sets on the same antenna without interfering with each other, and the sets operate the same as if they were on separate antennas.



The multicoupler is put in series with the lead-in wire and provides for the operating of 2 to 15 radio sets from one antenna.

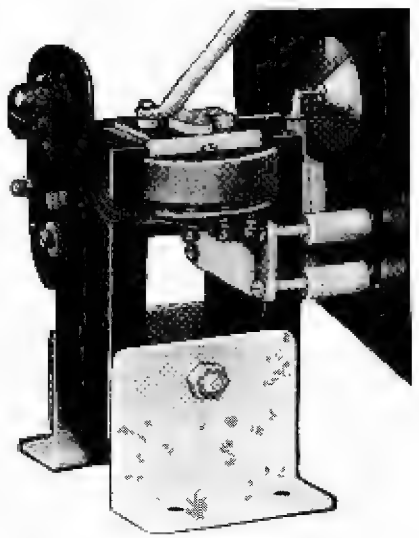


Above is shown the arrangement of the multicouplers to supply three radio sets from the same antenna. Photo at right: relative size of coupler.

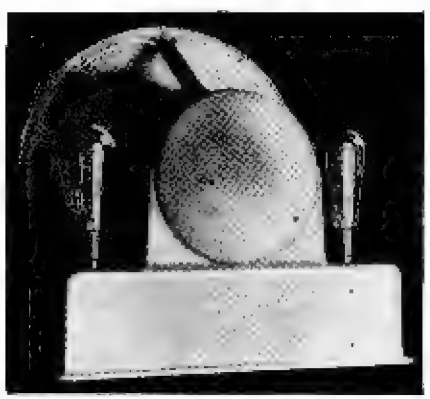
it is no longer necessary to clutter up the roof of the apartment house with many unsightly aerials. And where that is forbidden, it is no longer necessary to use inefficient indoor systems and lighting-circuit coupling devices. Efficient reception with this device is assured.

This "Motor" Speaker Is Not a Dynamic

THIS speaker has two unique features. It is not a dynamic speaker, but operates on an entirely new principle. Another feature is the tone selector, which makes it possible to match the impedance of any amplifier. Such a speaker gives results similar to a dynamic speaker, without connecting it to an external source of current, so that it is particularly suited for battery receivers. Manufactured by the Best Manufacturing Co.



New Power Dynamic Speaker

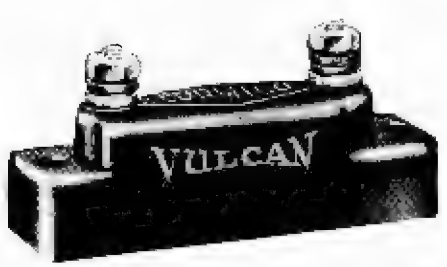


THIS product of the Best Manufacturing Co. is a dynamic speaker for large halls and theatres. It is much larger than the average speaker of this type and handles more power.

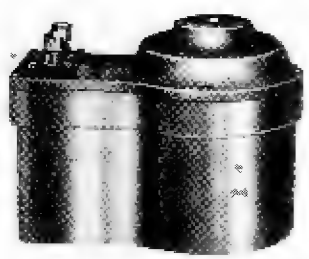
A speaker of this type fills the need for a dynamic speaker that will handle great volume without distortion.

An Improved Lightning Arrester

A STURDY lightning arrester of improved design is illustrated at the right. With such an arrester one need not fear lightning storms. It is a product of the Cornish Wire Company, New York City.



A Giant "Magnetic" Horn Unit



A MAGNETIC horn unit that will handle a vast amount of power, making it useful for large exponential horns used in halls and theatres, is shown on the left. Such a unit eliminates the necessity of having a separate exciting current for the field. The Racon Electric Co. are the manufacturers.

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A Monthly Question and Answer Department Conducted with a View Toward Helping Radio Constructors and Experimenters

RADIO ORACLE

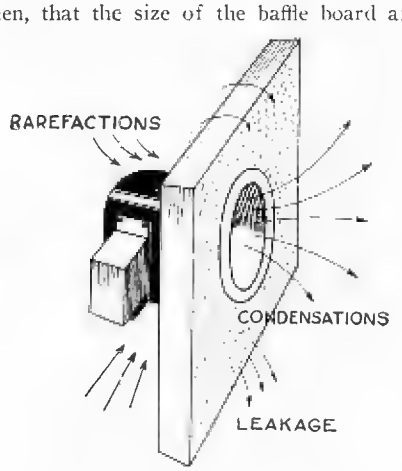
Devoted to Queries of General Interest

Baffle Board on Dynamic Speaker

(732) Mr. Fred Drake, Spokane, Wash., writes:

Q. 1. I do not understand the action of a baffle board on a dynamic speaker. What is its function? What is the best size and material?

A. 1. The action of a baffle board on a dynamic speaker is analogous to the action of a hand fan. When the fan is waved in one direction the air on one side is compressed and on the other side rarified. If the fan is large a great deal of the air puffs forward, but if the surface is small much of the air leaks around the edges. A dynamic cone when vibrating, produces much the same action. Air is compressed before it, and the air directly behind becomes rarified. The baffle board serves to divide the two columns of air and prevent one from neutralizing the other. The larger the baffle board, the less leakage will result. On lower frequencies greater columns of air are vibrated so that a larger baffle board is necessary to seal the air at these frequencies. It is obvious, then, that the size of the baffle board affects the quality of the speaker, the larger baffle board handling the lower notes better.



Showing how the air is distributed.

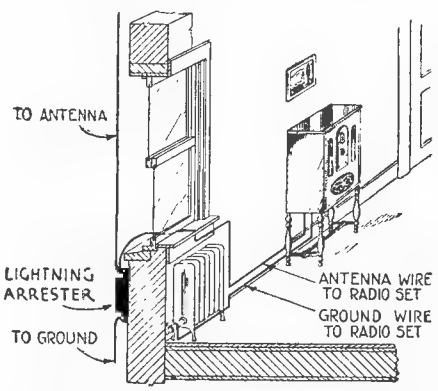
Thick non-resonance material is just as essential in a baffle board as it is in a loud speaker horn, as this prevents extraneous vibration being set up with a resulting distortion effect.

Lightning Ground

(733) J. C. Jones of Howard, Ill., writes:

Q. 1. I see from the Fire Underwriters code that the ground from a lightning arrester may be connected to a steam radiator pipe. Would not lightning be liable to strike in the house with such an arrangement?

A. 1. While the minimum requirements of the Fire Underwriters state that a lightning arrester may have any water pipe as a ground, we feel that in most cases the lightning arrester should have a separate ground outside the house as shown. Any piece of pipe can be driven a few feet into the ground and a connection made thereto. The lead wire should be as large as the aerial wire. It is best to run this wire as straight and direct as possible from the arrester to the ground. Such an arrangement should be a satisfactory compromise between the old system where a large, clumsy switch was necessary and the present minimum requirements.



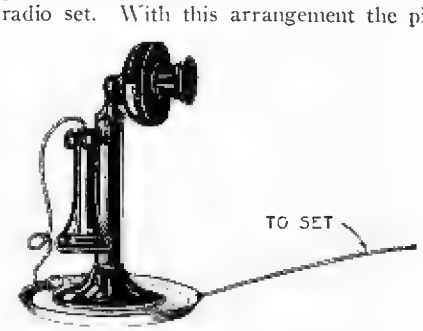
The lightning ground is hooked up as shown. The lightning arrester is connected to a separate ground.

Telephone Antenna

(734) H. E. Clements, Syracuse, N. Y., writes:

Q. 1. I remember some time ago seeing an arrangement for using the telephone as an antenna. Can you show me a diagram of how this should be done?

A. 1. The arrangement for using a telephone as an antenna system is quite simple. A pie plate or any other disc of metal is placed under the telephone stand and a connection is then run from the metal pie plate to the antenna connection of the radio set. With this arrangement the pie plate acts as one plate of a condenser and the telephone instrument as another, while the felt base acts as a dielectric. Capacity coupling is made with this arrangement to the extensive system of the telephone wires running through the house and to the street circuit.



The pie-plate antenna is placed under the telephone and a wire is run from the plate to the set.

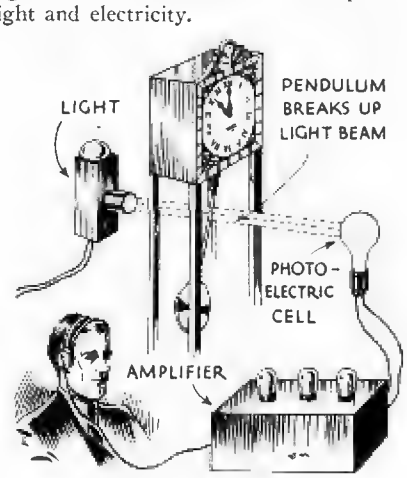
Sending Time-Ticks

(735) R. D. Noel, Burlington, Vt., asks:

Q. 1. Is it possible to rig up a clock so that time-ticks may be heard from it, similar to those sent out from the Naval Observatory? I should think that putting contacts on the pendulum would be all right. But that would be liable to interfere with the accuracy of the clock.

A. 1. The diagram shows an arrangement developed by the Bureau of Standards in Washington to obtain time ticks from a master clock without adding anything to the clock to interfere with the accuracy. A beam of light and a light-sensitive cell is used. As the pendulum crosses the beam of light the resistance varies in the light sensitive cell and a click is heard in the phone. This click may be broadcast by a transmitting station or the amplifier may be connected to a loud speaker.

It is not necessary to tamper with the clock when using this system. There is no lag as the tick travels with the speed of light and electricity.



Listening to time-ticks.

Cost of Running All-Electric Radio

(736) Mr. Hugh Smalley, Orlando, Fla., asks:

Q. 1. Is there a simple way of finding out how much electricity a radio draws from the house lighting system and how much it costs to run a set for an hour?

A. 1. The power consumed by an all-electric set may be compared with the power consumption of an ordinary light by noting the speed at which the metal disc on the electric meter revolves.

With all the current in the house turned off the disc will not move. A 100-watt lamp is lighted and the number of revolutions a minute the disc makes is noted. We shall say that the disc revolves six times in one minute. The lamp is then turned off and the radio set is turned on. The number of revolutions of the little disc are again noted. If these are twelve it is obvious that the radio set consumes twice the power that the lamp did or 200 watts. The 200 is divided into 1,000 and the percentage of a kilowatt is found. At 10c a kilowatt hour it would cost 2c to run the radio set for one hour.

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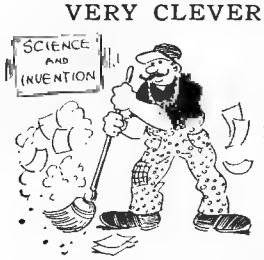
Scientific Humor

A Monthly Fun Page for Those Who Enjoy a Laugh

JOKEY JUNK

Here's submitting a bundle of jokative junk—
Some of them are good, some, doubtless, are punk;
O'er the bum ones I don't expect you to enthuse,
But just send me a "cartwheel" for each you can use.
And, should one prove the best
Of the month by your test,
I won't be inclined to feel sore
If you send me three plunks
For that fragment of junk,
Indeed I wouldn't kick if 'twas more!
—*Chas. A. Pease.*

VERY CLEVER INDEED



JUDGE—Lejinsky, what great thing have you ever done in this country to merit citizenship?

LEJINSKY—I'm the janiture at da Science and Inventory Buildin'.—*Rush.*

A CLEAR CASE

"See your five and raise you ten," said the poker player as he glanced at the mirror behind his opponent.
—*J. S. Railsback.*

IMPOSSIBLE

HOKUS—I've been stung by a hornet.

POKUS—Put liniment on it.

HOKUS—I can't, it flew away.—*Leslie F. Carpenter.*

EXTINGUISHED

PROFESSOR—What is a flame test?

STUDENT—Taking your girl for a ride on a trolley car.
—*George Beisser.*

First Prize—$3.00

LIKE RATTLING BONES

DECKER to SWENSON (playing uke)—What key you playing in?

SWENSON—Skeleton key.

DECKER—Skeleton key?

SWENSON—Sure, fits anything!
—*Harry Huthmacher.*

OF CORPSE IT IS

TEACHER—Why does a priest use Latin during a funeral?

BRIGHT BOY—Because it's a dead language. —*Leslie F. Carpenter.*

ALL jokes published here are paid for at a rate of $1.00 each; $3.00 is paid for the best joke submitted each month.

Jokes must have a scientific strain and should be original.

Write each joke on a separate sheet of paper and add your name and address to each.

Unavailable material cannot be returned.

KNOWS HIS SOAP

TEACHER (to pupils)—Octagon is a plane figure of 8 sides and 8 angles. What is a plane figure of 7 sides and 7 angles?

BRIGHT PUPIL—Kirkman.
—*Stanley Balacki.*

VERY BZ

"Who's that making V's on the sidewalk?"

"That's Einstein. He's drawing parallel lines. —*Irvin T. Bonifield.*

SCOTCH FAMILY

MR. BROWN—May I use your phone, Mrs. Smith?

MRS. SMITH—Certainly, is yours out of order?

MR. BROWN—No, dad's using it for a paper weight; cook's cutting biscuits with the receiver; Sis is using the mouthpiece for an ink well and baby is using the cord for a jumping rope.
—*Leslie F. Carpenter*

RUNS IN CYCLES

ELECTRICIAN—Watt reaction do you get from your "Ohm" brew?

ENQUIRED—Well, it has a "load factor" of about seven per cent., but it doesn't "phase" me.
—*W. Binton*

FOR AVIATORS ONLY

FRED—Say, how can aviators tell if they are flying upside down when they are 5,000 feet high?

NED—They use a wet meter.

FRED—How is that?

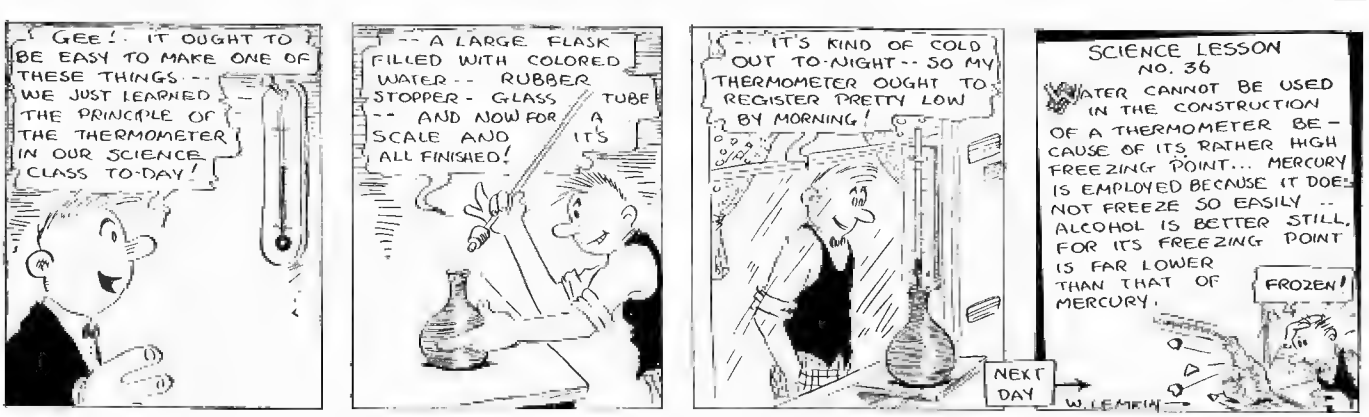
NED—They pour water in their pants, and if it runs down their neck, they are flying upside down.
—*J. A. Bellemane.*

GOOD YOU CAN'T DRINK IT

NIP—How did that persimmon beer turn out that I gave you the recipe for?

GARGLE—Oh, it puckered up the mouths of the bottles so I couldn't pour it out!
—*Henry A. Courtney.*

SCIENTY SIMON SCIENTIST


GEE! IT OUGHT TO BE EASY TO MAKE ONE OF THESE THINGS -- WE JUST LEARNED THE PRINCIPLE OF THE THERMOMETER IN OUR SCIENCE CLASS TO-DAY!
-- A LARGE FLASK FILLED WITH COLORED WATER -- RUBBER STOPPER - GLASS TUBE -- AND NOW FOR A SCALE AND IT'S ALL FINISHED!
-- IT'S KIND OF COLD OUT TO-NIGHT -- SO MY THERMOMETER OUGHT TO REGISTER PRETTY LOW BY MORNING!
NEXT DAY
W. LEMEIN
SCIENCE LESSON NO. 36
WATER CANNOT BE USED IN THE CONSTRUCTION OF A THERMOMETER BECAUSE OF ITS RATHER HIGH FREEZING POINT... MERCURY IS EMPLOYED BECAUSE IT DOES NOT FREEZE SO EASILY -- ALCOHOL IS BETTER STILL, FOR ITS FREEZING POINT IS FAR LOWER THAN THAT OF MERCURY.
FROZEN!

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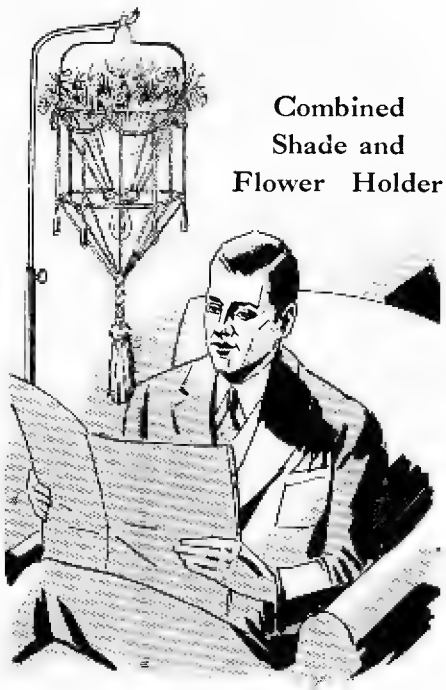
Latest Patents

Notice to Readers:

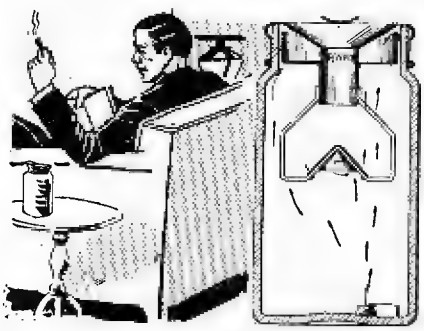
These illustrated and described devices have recently been issued patent protection but are not as yet, to our knowledge, available on the market. We regret to advise that it is impossible to supply the correct addresses of inventors of the devices to any of our readers. The only records available, and they are at the Patent Office at Washington, D. C., give only the addresses of the inventors at the time of application for a patent. Many months have elapsed since that time, and those records are necessarily inaccurate. Therefore, kindly do not request such information, as it is practically impossible to obtain up-to-date addresses.

Combined Shade and Flower Holder

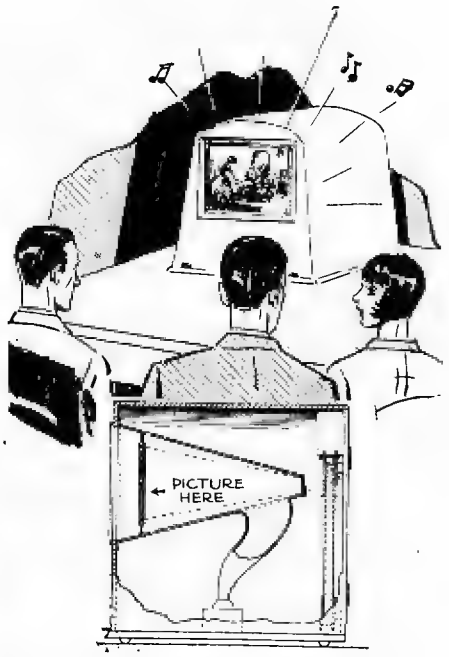


No. 1,718,266, *issued to Hyman D. Weissberg. This invention provides a basket-like, collapsible frame for electric light fixtures, lamp stands and the like capable of being converted to different uses. It is an ornamental hanging fixture consisting of a wire-covered loose frame.*

Smoker's Waste Receptacle

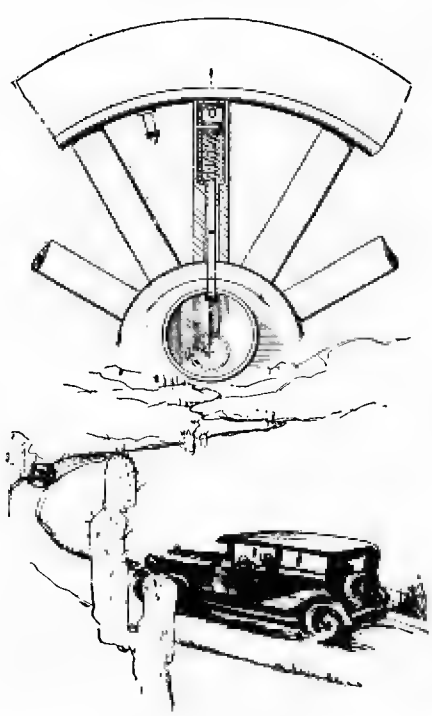


No. 1,719,925, *issued to George H. Cruess. The receptacle here shown will retain smoker's waste such as ash, burnt matches, and stubs of cigars and cigarettes within a compartment in such a manner as to prevent the odor of the waste from contaminating the atmosphere and to provide means to prevent the cigars, cigarettes or matches from accumulating in the path of the opening of the receptacle.*



Sound and Picture Reproducer

No. 1,710,994, *issued to Albert T. Marshall. Sound reproducing and picture exhibiting apparatus is combined in this device. The sound is projected around the edge of the motion-picture screen. This makes a portable exhibiting outfit which will be useful for advertising and educational purposes.*

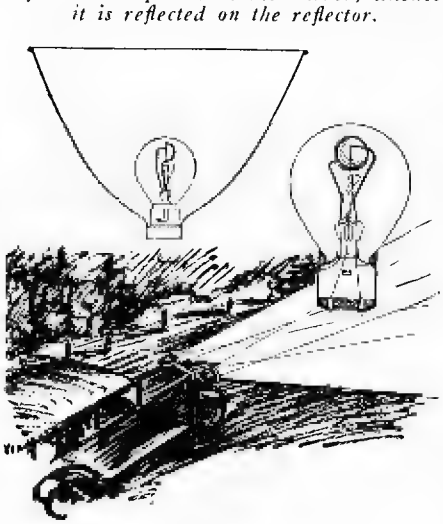


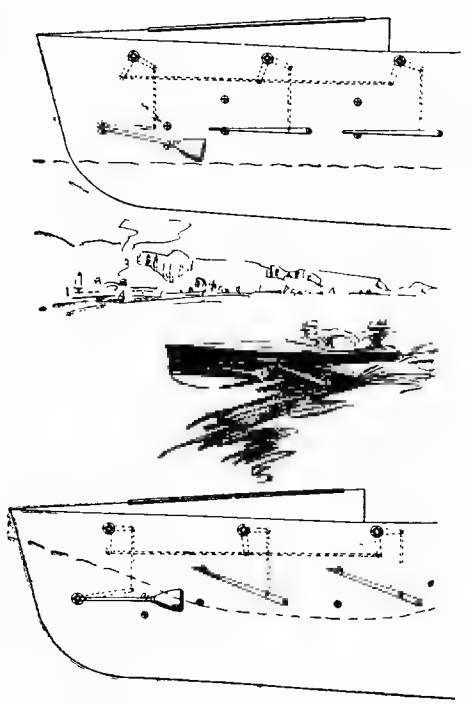
Tire Inflater

No. 1,713,899, *issued to Raymond A. Gray. This device provides a novel means whereby pressure in a tire may be automatically maintained uniform. The compressor has a spring for actuating the compressing element in a direction to force air into the tire. The piston is actuated by a cam on the wheel, the actual pressure maintained by the device being maintained by a cut-off valve. The device may be made a part of one of the spokes of the wheel.*

Glareless Headlight

No. 1,716.048, *issued to Arnold Graves. This is a lamp for an anti-glare headlight for vehicles of the type in which the light source in combination with a small hemispherical mirror is placed inside a parabolic or similar reflector, part of the light from the source falling directly onto the reflector and part onto the mirror, whence it is reflected on the reflector.*





Speed Boat Safety Device

No. 1,710,217, *issued to Henry A. Janacek. A device for use upon speeding and racing boats is provided for in this invention. The prime object of the invention is to provide for a means to cause the boat to be lifted to safety when it strikes a high wave. The device is inoperative in calm water, coming automatically into use in rough water.*

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A Monthly Scientific Question and Answer Page

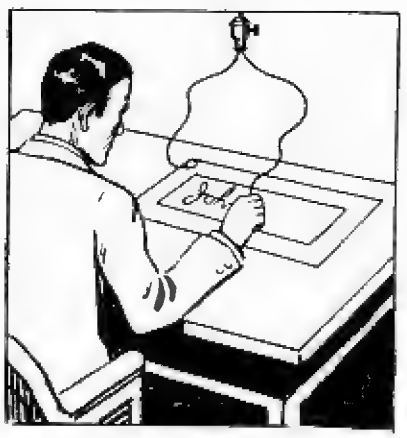
The Oracle

Writing Electrically

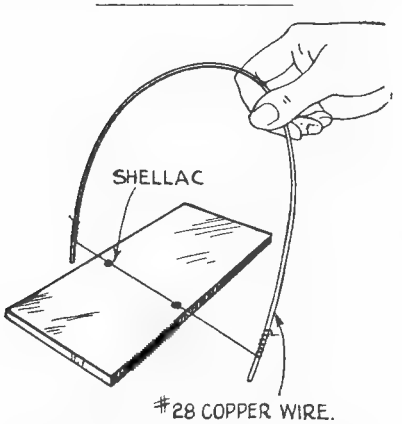
(2330) Mr. Henry F. Sturgis, Lititz, Pa., asks:

Q. 1. What kind of a paper can be put on a sheet of metal so that when a wire from one side of the house-lighting circuit touches the paper it will leave a mark. The other side of the house lighting circuit is connected to the metal plate.

A. 1. There are quite a few chemicals that can be used for this purpose. One of the most popular being ordinary potassium iodide. The paper is soaked in a solution of potassium iodide and then



dried. Previous to use, it is moistened but very slightly. A brown mark will be left on the paper where the wire from the lighting circuit comes in contact with it. This mark may fade later. Bichromated gelatine and many other chemicals which will change their colors when coming in contact with a source of current as you suggest, will also answer the purpose. The solutions in various polarity testers which change color when connected across the leads of a circuit could also be pressed into the service. It is interesting to note at this time that sparks can also be used to deposit particles of metal on a piece of paper. This is one of the systems employed in the transmission of colored pictures, by telephotography.

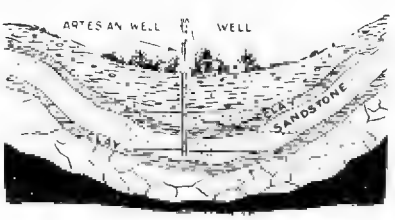


Lines from Spider Webs

(2331) Mr. Harold T. Darwin, Philadelphia, Pa., writes:

Q. 1. I would like to put a very fine line on a glass slide. The line must be exceptionally thin. Scratching it on the glass is not satisfactory. Please tell me what else I can use.

A. 1. You will find that ordinary spider webs are very serviceable for this purpose. You should not get the web that has the globules upon it but you should use one of the supporting strands. The best way to handle the situation is to make a small bow with about No. 28 copper wire. Twist the spider web around one end of the bow, then cutting off a suitable length, twist the other portion around the other end of the bow so that the hair is stretched. Now slide this strand of spider web on the piece of glass and hold it in place with soft wax or any other convenient adhesive. A small drop of shellac or varnish will also answer the purpose. The hair is left in this stretched position until the shellac or varnish is dry, after which the ends can be cut away.



Artesian Wells

(2332) Mr. John E. Doyle, Charlotte, N. C., asks:

Q. 1. Why is it that when one digs an ordinary well, the water stays in the bottom of the well, yet when an artesian well is dug, the water generally bubbles out at the top.

A. 1. All wells and foundations are examples of the laws of equilibrium of liquids in communicating vessels. Let us assume that we take an imaginary section of a portion of earth's crust, containing two impervious strata of, let us say, clay, and one pervious strata in between, of sandstone. We thus have a basin into which waters filter and from which they cannot escape, being confined by the impervious strata both above and below. Now if we bore an artesian well in the valley and we reach the imprisoned water between the two impervious strata, the water will be thrown up in a jet. The height of this jet will depend upon the lofty ridges or elevations of the edges of the basin. These elevations may be hundreds of miles from the well. As a matter of fact, artesian wells have been successfully bored in the African Desert on the Great Caravan Route. This water comes from mountainous areas many miles away.

Any ordinary well driven in the valley would merely get the local water and unless there were a rising on either side we would not get an artesian form of well or any flowing spring whatever.

The "Oracle" is for the sole benefit of all scientific students. Questions will be answered here for the benefit of all, but only matter of sufficient interest will be published. Rules under which questions will be answered:

1. Only three questions can be submitted to be answered.

2. Only one side of sheet to be written on; matter must be typewritten or else written in ink; no penciled matter considered.

3. Sketches, diagrams, etc., must be on separate sheets. Questions addressed to this department cannot be answered by mail free of charge.

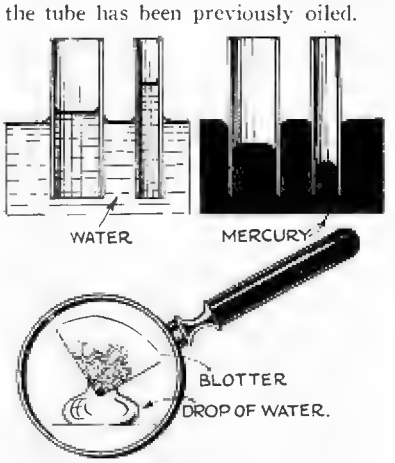
4. If a quick answer is desired by mail, a nominal charge of 50 cents is made for each question. If the questions entail considerable research work or intricate calculations, a special rate will be charged. Correspondents will be informed as to the fee before such questions are answered.

When Water Runs Uphill

(2333) Mr. J. B. Downing, Guthrie, Okla., writes:

Q. 1. Why and how does dry sand or blotting paper make water run uphill? I have been on a dry desert and noticed the water running up a pile of dry sand in a few minutes. Blotting paper will do the same without pressure.

A. 1. The reason for this is known as "The principle of Capillarity." If you will take a small glass tube having a very thin bore, you will find that the water rises upward in the inside of this glass tube. The smaller or more minute this bore is, the higher will water rise. Any other liquid which wets the sides of the tube will likewise rise, but a liquid which does not wet the sides of the tube will be depressed. Thus mercury is depressed by a capillary tube. Water will also be depressed by such a capillary tube if the tube has been previously oiled.



Water Runs Uphill, Due to Surface Tension.

A blotting paper may be likened to a group of such small minute tubes. The water wets the blotting paper and by capillarity it is caused to rise upward. This is because the meniscus of the surface of the water is curved and this meniscus has a tendency to straighten itself like a rubber diaphragm. The same theorem can be applied to a pile of sand. The interstices between the granules of sand act like minute tubes and permit of this phenomenon of capillarity. If you oil a piece of blotting paper you will find that it will not absorb water.

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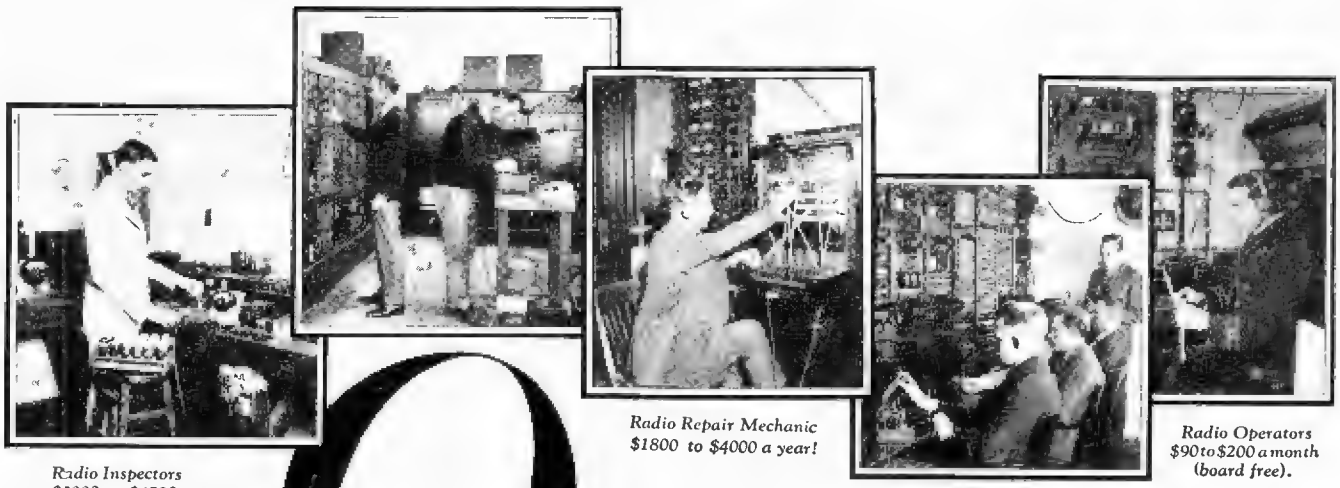

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Are Oil Burners Practical for the Home?

By Harry F. Tapp

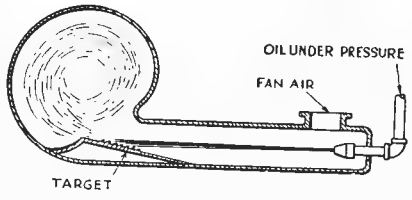
(*Continued from page* 603)

eliminated. Burners of this type are especially flexible with low oil capacities, but they require a lighter, more volatile fuel, and in poorly designed burners there is the possibility of carbon trouble, due to the "cracking" or decomposition of the oil.

Atomization is the mechanical breaking up of the liquid oil into a fine mist which will readily mix with the combustion air and burn freely. This can be accomplished in a variety of ways. For example: (1) By compressed air supplied from a rotary, or a reciprocating piston compressor. This method is similar to the familiar perfume atomizer. (2) By the pressure of the oil itself thru a small orifice in the same manner as water is sprayed from the nozzle of a garden hose. (3) By means of centrifugal force from the edge of a cup or plate rotated at a high speed.

There is a great variety of design in which the general methods outlined above are incorporated either singly or in combination and their effectiveness depends more upon the reliability with which they are built and installed, than on the inherent advantages of the methods themselves.

There is also a type of burner known as the "natural draft" burner. The oil is vaporized on a hot plate or in a generator and the air for combustion is supplied by the natural draft of the chimney. It is



Gun and target oil atomization—how the oil is broken up by impinging on the ribbed target.

not hard to understand that the natural draft burner is sensitive to changes in weather, air currents about the chimney, and other factors which are likely to vary the intensity of the draft and for this reason—the combustion is not always uniform and efficient. It is possible however, with proper chimney construction and the use of a good automatic draft regulator, to obtain reasonably satisfactory results. This type of burner is often incorrectly called a "gravity burner." Gravity feed to the burner and gravity feed may be used with either natural draft or mechanical draft burners.

In order to obtain the most satisfactory, uniform and efficient results under normal operating conditions, it is essential that at least a major portion of the air for combustion be supplied mechanically by a fan or blower.

In general, there are three different ways in which oil burners are ignited—manually, automatically by electricity or by gas. In practically all natural draft burners the ignition is accomplished manually. That is, it is necessary to make a torch of some kind and light the burner thru the firing door. Automatic ignition is accomplished electrically either by means of a spark from a high-tension transformer, or by means of a hot-resistance element, or combination of the two. The spark type however, is the more widely used at the present time.

(*Continued on page* 640)

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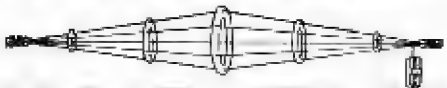

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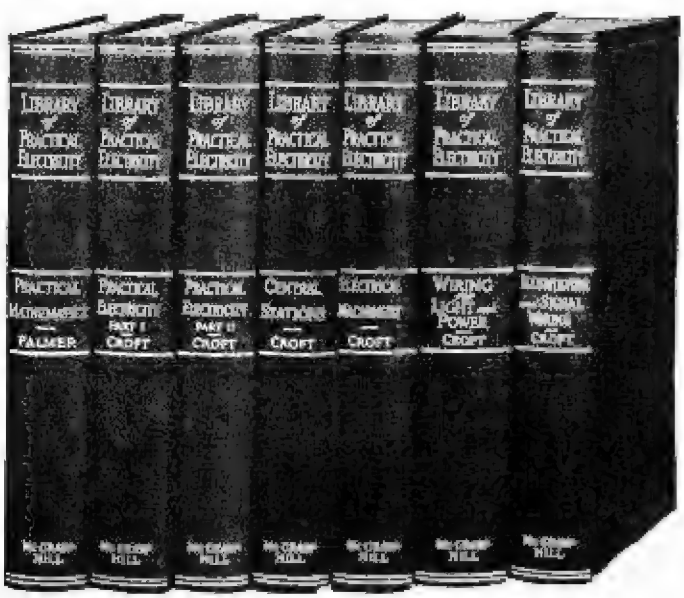
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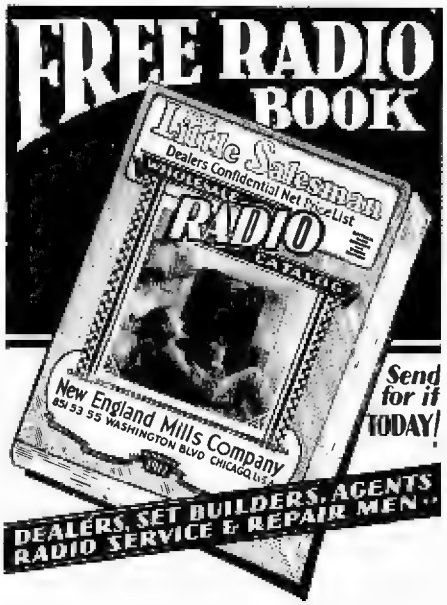

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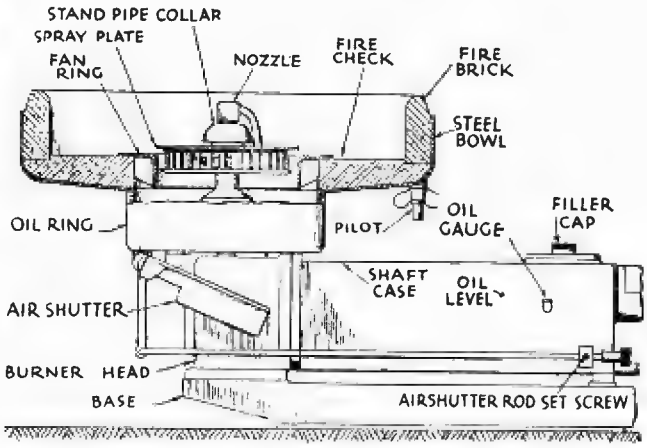
Are Oil Burners Practical for the Home?

(*Continued from page 638*)

Some burners, due either to the preference of their designer or to the construction of the burner, have a gas pilot for ignition. This is in the form of either a constantly burning pilot light; a pilot light expanding at the time of ignition; or a combination gas-electric pilot light in which the gas is turned on just previous to the time required for ignition and the gas is ignited by an electric spark similar to the one used for igniting the oil direct. In general, there is no particular advantage of one type of ignition over the other. A gas pilot light limits the use of the burner to localities where a supply of manufactured gas is available, or requires the use of gas purchased in containers in which case, the combination electric-gas ignition is more economical.



The picture at left shows cross-sectional view of rotary disc oil burner (Ætna). The oil is prepared for combustion by atomization.

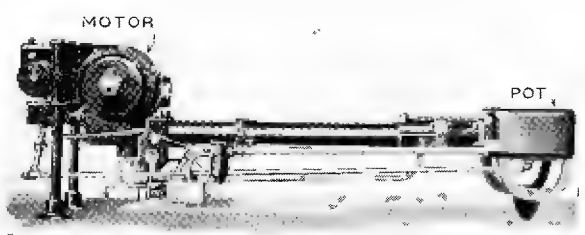
In addition to the general classifications as: mechanical draft, natural draft burner and the terms atomizing and vaporizing, there are additional terms used to further differentiate between the various burners on the market. These can well be called trade names.

"Pot Type" indicates that there is a metal combustion chamber built as an integral part of the burner. They usually employ vaporization and are limited to the use of the lighter, more volatile fuel oils. They do not require the use of any refractory material in the ash pit or combustion chamber of the furnace.

"Rotary Disc" burners are similar in some respects to the pot type except that they have a refractory hearth in place of a metal pot and prepare the oil for combustion by atomization with a rapidly rotating disc which is driven usually by a motor located outside of the boiler or furnace.

"Gun Type" burners are designed so that all of the mechanism is outside of the combustion chamber, which is made of firebrick or a plastic refractory, shaped in the ash pit to meet the requirements of the particular boiler or furnace.

"Vertical Rotary" or "Inside Rotary" burners are those designed so that practically the entire mechanism is enclosed in the ash pit and a refractory hearth built about the atomizing head. With some burners of this type the oil is burned in suspension, while in others, it is burned in contact with specially designed refractory bricks located next to the heating surface of the boiler or furnace.



Pot type oil burner (Nokol), described by the author in the text. The pot is placed in the fire box of the furnace.

The next article will tell of some of the advantages of oil heat and offer some suggestions for better use of the basement.

Railway to Airway

By Harold Donitz

(*Continued from page 588*)

the supply of gas to a dangerous minimum. Also, the new Dornier "DOX," of twelve motors and 6,000 horsepower, will be able to fly on only half its motors, but will require all of them to leave the water.

It is almost inconceivable that such monsters as the DOX or the Rohrbach Romar, or the greater flying boats to come, will be launched on their flights from a carriage on rails; but it is quite probable that in the not-so-distant future such an arrangement will be considered an important feature of every large flying boat and seaport terminus.

A track and cars built to serve the largest flying boats in use today, including the Dornier Superwhal, the Rohrbach and Savoia-Marchetti models, and the PN type of the U.S. Navy, would have to differ greatly from any railroad now in use. The track would require a gauge of at least ten feet, and the cars used would be from fifteen to twenty feet in width. The track, located on a little-used beach or on an embankment through a swampy meadow, would be from two to three miles in length, and head into the prevailing winds. Two cars would be necessary, one a flat car, whose floor would be not exactly flat, but consisting perhaps of greased rollers, to reduce the sliding friction of the plane's bottom to a minimum. Behind this would be an electric locomotive, draw-

(*Continued on page 642*)

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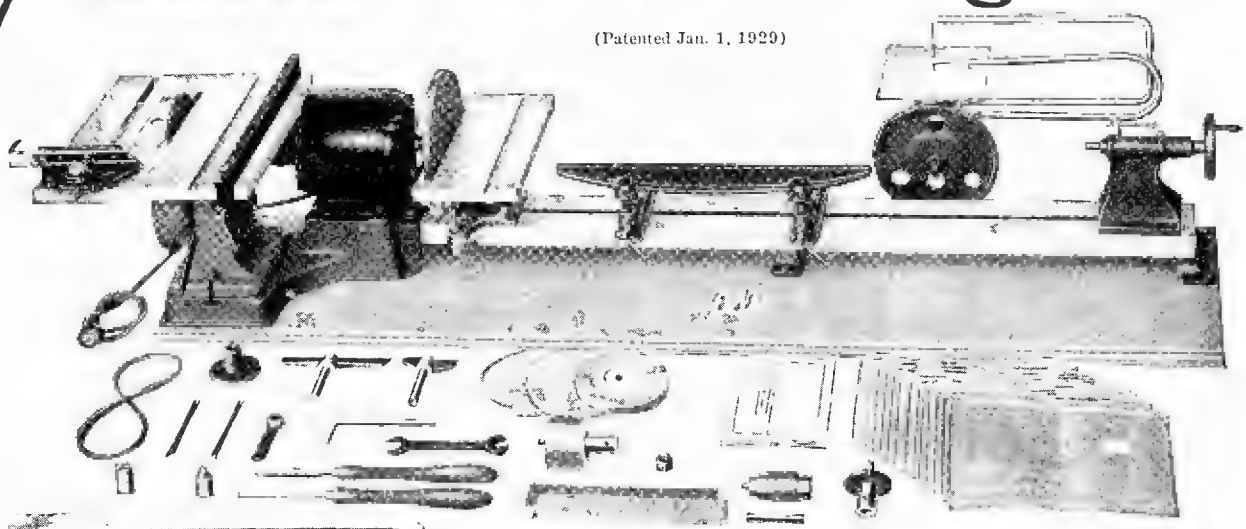

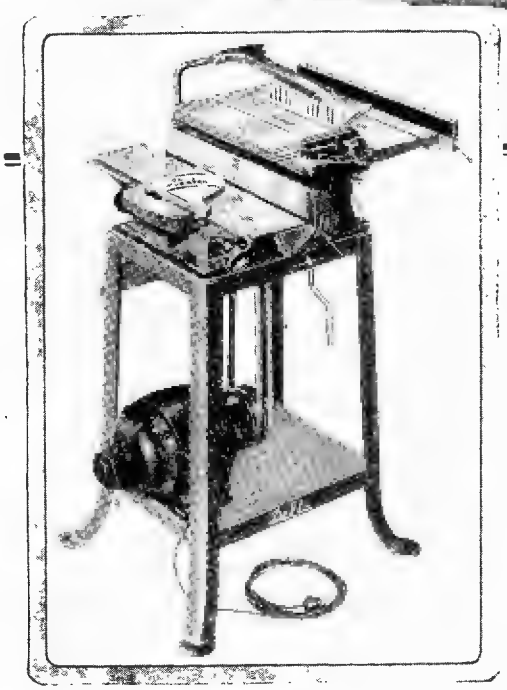

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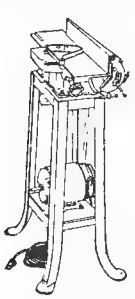

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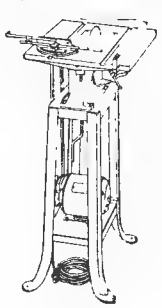

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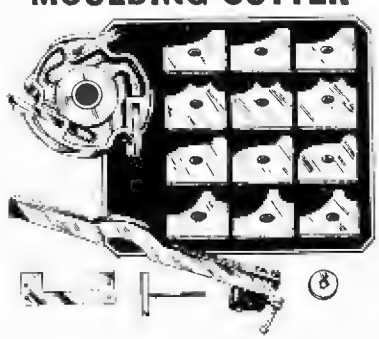

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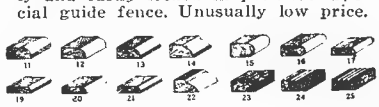

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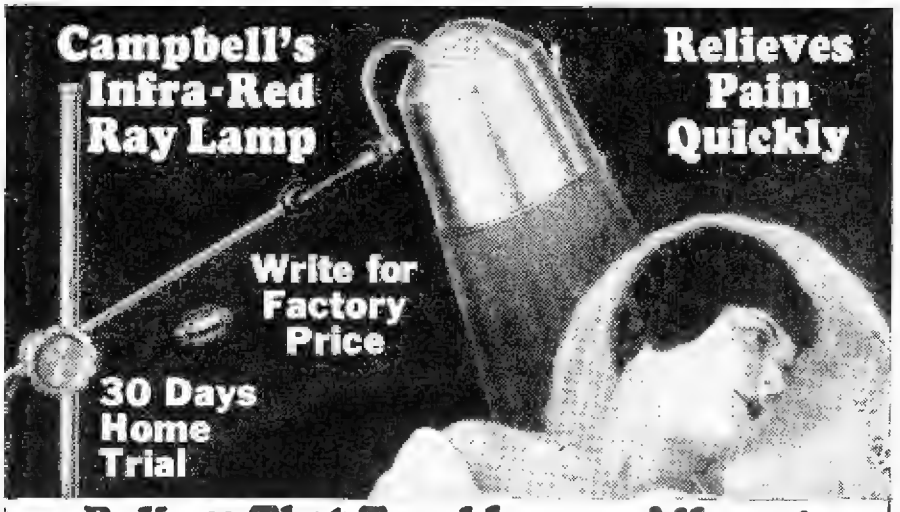

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Railway to Airway

(*Continued from page* 640)

ing its power from a third rail running alongside or between the tracks.

Let us visualize a flying boat at a coastal airport of the future, about to start off on a voyage of anywhere from five hundred to a thousand miles.

Behind the waiting room of the port, and close to a little inlet, is the "starting" end of the track. On the track is the flat car and its pusher, and a huge ramp leads from the water to the level of the car's floor. Cables, winches, and a crew of men are guiding the big plane up the ramp and into position on the car. The three or four motors are started up, and the twenty passengers file into the comfortable cabin. When the engines are well warmed, the locomotive starts, slowly but with mounting acceleration, up the track. As the powerful train approaches the necessary speed, the motors of the plane are speeded up until they are developing their maximum horsepower.

At a signal from the pilot, an attendant on the flat car releases a block from the front of the hull, and the flying boat, no longer a massive mechanism but a graceful bird, mounts into the air.

The engineer of the locomotive shuts off the power, and as the train comes within half a mile of the end of the track, begins to apply his brakes. Soon the train comes to a complete halt, and proceeds slowly back to the airport.

Commercial aviation is reluctant to experiment. At present it must use only such equipment as has earned the faith of the public, either through long and efficient service or through successful sensational flights. But commerce, especially in the new world, hasn't even begun to take full advantage of the flying boat, and when it does, the scheme described above, or one similar to it, will be inevitable.

What Our Readers Think

(*Continued from page* 627)

$21,000 what he was able to do for other people present who paid the same admission price we did? We do not hold that the subconscious mind knows all. We do believe it is the causative factor in the operation of the Ouija board.—EDITOR.)

How to Build a Bicycle Catamaran

(*Continued from page* 628)

sheeting should be used for the supporting straps. A sprocket wheel can be obtained from an old bicycle and fastened onto the paddle wheel. The wheel and axle can be fastened to the raft by various methods, depending on the material at hand. Additional links will have to be put in the original chain to make it long enough.

Don't Miss the
RADIO ARTICLES
In Our
December Issue!

Photo Credit Correction

On page 319 of our August issue a photograph appeared, showing the searchlight illumination at night of the Union Trust Building of Detroit, Mich., but the caption credited the edifice with being the Fisher Building, through an error, which we are glad to rectify.—Editors.

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Home Movies

By Don Bennett

(*Continued from page* 617)

be used all the while his head is turned. To show that he is moving, a background is slid past him, painted on a third piece of celluloid, a strip as long as is needed.

"In this photo (Fig. 1-B) we see Felix's outline being inked in, the next to the last step before photographing. Another man is doing this, the animator doing no more than make the pencil sketches. In this last photo (Fig. 1-C) we see him being filled in with ink to form the creature so familiar to us. You will notice that the pilot pins are evident in each photo. This guarantees perfect registration every time.

"There certainly seems to be a lot of work in one of those cartoons, Mr. Jones. About how many drawings are used in a reel?"

"Naturally, that varies somewhat. In a reel of the theatrical size film, 1,000 feet in length, there are 16,000 separate pictures. That means there can be that many drawings. However, by employing the time-savers I just explained to you (the use of celluloids) this number is possibly reduced somewhat, possibly to 12,000.

Fig. 2—Various moving figures used in making Hallowe'en motion pictures.

Some cartoons have been known to run as high as 30,000.

"The method I use is adapted from the process used for showing machinery in action. A scale drawing is used and the various working parts are cut-outs mounted on bristol board and pivoted together. You can do the same thing with figures, planning them only in silhouette, so that they do not have to face the camera.

"Let's see if we can't plan a Hallowe'en film that will be easy to make and yet have plenty of fun in it for the kiddies. First, let's get our characters lined up. We need the witch on her broom, the cat with the straight tail, the owl sitting on a crescent moon, the jack-o'-lantern made from a pumpkin, and a house. We'll make the cat jointed, have the eyes of the owl blink and the whole face of the jack-o'-lantern will light up and go dark.

"The witch, cat (Fig. 2) and pumpkin will be separate figures and the house will be painted on the background. We'll use that title-board you built to make it on. (See SCIENCE AND INVENTION for January, 1929.) Place it on the table for vertical shooting. On the title-board we will fasten a plain background of medium gray paper, to give a night sky effect. (See Fig. 3.) Fasten this down with gummed

Are Your Opportunities Slipping By?

THE years roll by faster and faster seemingly. More and more frequently come those moments when we regret the opportunities we allowed to slip by. When we realize that we have made little or no progress; that we have acquired no new mental equipment, and no increased capacity for business or social life.

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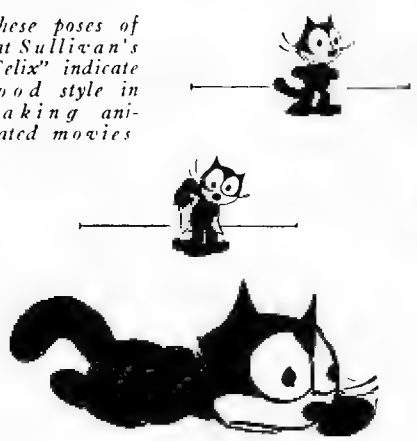
paper, as thumb-tacks would cause the celluloid to wrinkle. The figures should be made on a mat surface paper and all paints used should be a dull finish. Show-card color will be satisfactory. Let's assume that our lens will cover an area about eight by ten inches. Our background piece will be an inch larger than that on each side. We will use a strip of celluloid fourteen inches wide and about thirty-six inches long. On this we will paint a landscape with trees and shrubs in silhouette (Fig. 3). All this should be black. Fourteen inches from the right edge we paint a white moon with an owl sitting on its rim. Leave large round eyes for the owl. About four inches from the left edge paint a house with a little smoke coming from a chimney and with two or three windows brightly lit. The windows will have to be painted in white, or possibly white with just a little touch of black or blue in it to tone it down a bit. Then sprinkle some stars around the heavens all along the celluloid, using either white or aluminum.

"Now place two guide strips top and bottom for the celluloid to slide in. These guide strips can be thin pieces of bristol board an inch or so wide. The thickness should not exceed one-sixteenth of an inch. To these guide strips fasten a clear piece of celluloid to serve as a support for the figures. Stretch it fairly tight and tack it down.

These poses of Pat Sullivan's "Felix" indicate good style in making animated movies



"Now we are ready to shoot. Put the celluloid strip in the guides so that the right edge is just past the picture area. Put the witch in place about half way up the scene and about a third in from the right edge. Now set your camera at half speed, because all of this is in stop-motion, and half-speed gives you better control of the camera. You will fade in on this scene in about forty frames, so close the diaphragm all the way and make *single exposures,* opening the diaphragm a tiny bit after each exposure. When you reach twenty, start moving the celluloid strip to the right an eighth of an inch for each exposure. This will cause the sky to move across in back of the witch and give the effect that she is sailing through the air. The cat is riding on the broom in back of her. At forty you will be fully in and you continue to make single exposures and move the celluloid an eighth of an inch at a time. All this time the owl is moving across sitting on the moon. On the fixed celluloid have a piece of black paper covering his eyes. At forty frames, twist the paper so that one eye is opened. Continue this until sixty and then close it again by twisting the paper back into place. The paper must be slid across the fixed celluloid in time with the movement of the strip.

"At eighty, open the same eye again and at eighty-five open the other. At ninety-

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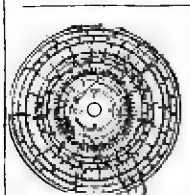

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five, close them both and open them again at a hundred. At this point introduce the jack o'lantern with a strip of black paper covering it, so that the openings do not show. Move it across the fixed celluloid in step with the strip. At 120 have the cat reach up with a paw (an extra one cut out of a separate piece of paper) and tap the witch on the back twice. Four frames to lift the paw, two frames touching the witch each time and two frames between; four frames back to normal and remove the extra leg. Now uncover the face of the jack o'lantern and have the witch stop. This is done by stopping the background. Slow it down by only moving a sixteenth of an inch and finally stopping altogether. Eight frames will be about right for the stop. Now the cat jumps down to the ground, so that he lands right alongside the pumpkin. He puts his paws up and starts rolling it along the ground. This is done by rolling the pumpkin around on its center while the background moves at the former rate of speed, the witch still flying overhead. The cat is not moved, simply standing with his paws up on the pumpkin, unless you want to put an extra hind leg on him and have him walk. The discrepancy will probably go unnoticed. If he walks there should be four movements of each leg to a step, but both legs must be moved to give the effect of walking, sort of a scissors movement.

"Before long the house will appear at the right and as soon as it comes clear of the edge, stop it and let the cat roll the pumpkin up to the house, the witch following him overhead. As soon as the pumpkin reaches the house (right side up) the cat jumps up to the witch's broom again and they move off the screen at the left. All this time the background is still. When they are clear, moving at the rate of an eighth of an inch a frame, place some small pieces of paper on the face of the jack o'lantern. One of these should cover his mouth, one his nose, and one over each eye. The one over the right eye is pulled about half way up as if he is peeking at something. Then it opens fully and the left eye opens. The mouth and nose are then uncovered and after that right eye gives a ten-frame wink (covered up). Now slide him over so that he covers the house and suddenly cover his face as if he has turned around.

"Replace the setting with one of a window frame from the inside reaching from the bottom to the top of the picture area. Have the edges light to represent the lighted walls of the room. The window space is pitch black until we see slowly opening the eyes of the jack o'lantern peeking through the window. Finally his whole face is exposed and right then is the time to have someone 'planted' near the screen who is good at screaming on demand. It will give your guests quite a jar and leave them laughing. If you want to carry on further without the trouble of filming, you can have enacted a little playlet in silhouette behind the screen, switching on the silhouette light as the projector is switched off. This whole film, if properly timed, will run about a minute and a half if sufficient timing is allowed at all the pauses and for all the cat's and the pumpkin's movements. That means about twelve hundred exposures, but the movements are all very simple. It should be possible to make this film in an evening if all preparations have been made beforehand. And it will be an evening well spent."

"That's a corking idea, Mr. Jones, and you can believe me when I say I'm going to start tonight."

(Next month Mr. Jones will discuss "How to process your films at Home."

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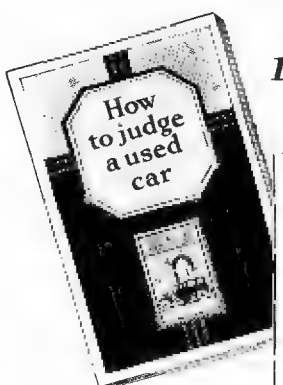

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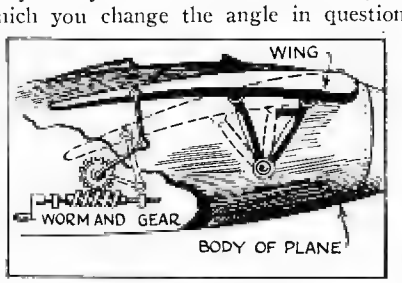
Feathering Airplane Wings

(1192) C. P. Craig, Martinsville, Va., has designed an airplane in which the wings are so arranged that the angle of incidence of those wings is increased when taking off or landing. He asks whether we consider this a good plan.

A. 1. While the design which you have inquired about is similar in effect to airplanes that have been patented by other inventors, you could probably get a patent on your system because of the way in which you change the angle in question.



The worm and gear arrangement is to change the angle of the wings for quicker take-off.

Not so long ago, SCIENCE AND INVENTION Magazine published photographs of the Bonney Gull and of what happened to it. Mr. Bonney was killed in the accident to his brain child. He worked upon this for years, developing all of the parts in laboratories, where they were submitted to wind tunnel tests.

The plane was so arranged that the angle of incidence could be increased for take-off and landing, and when in the air, it could be changed so as to make for the greatest amount of speed. Unfortunately, Mr. Bonney never proved that his ideas were of value, and he spent a small fortune in developing them. While we have no doubt but that planes will use some such method for increasing the angle at the beginning and termination of flight, the industry itself is probably advancing as rapidly as one could expect, yet it is still in its infancy.

The planes of the future might be so different from our modern constructions that any patent you might get on such an idea would be of no purpose. We would not advise further action.

Auto Brake

(1193) M. S. Chapman, Johnstown, Pa., has asked what he can do with an idea of an automobile brake which has no brake-lining, steel disc or other form of friction; would prevent screeching, wearing or burning; will last for the life of a car without replacement; will stop a car quicker than the best brakes without locking the wheels; will prevent skidding and increases the efficiency in second gear; has few working parts and never loses its efficiency.

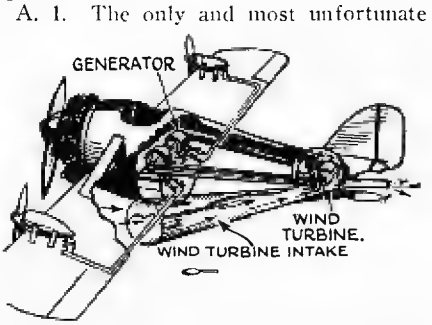
A. 1. With the many advantages of stopping an automobile which you have expounded in your communication, it seems strange to us that you cannot pool the interests of some of your associates and friends, and get them to invest a small sum of money in your patent. We would advise that you establish the usual claims of priority, and then take the idea to those of your friends from whom you could expect aid for an interest in the patent; an investment of $20.00 or $25.00 each. A patent would probably cost you no more than about $200.00 and if your invention proves to be what you claim it is, you should have no difficulty in selling the product.

While the advantages that you point out might be apparent to you, they may on the other hand not be apparent to the manufacturer, and he would want to be shown. You have given us no details of your invention, and consequently, we are not in a position to comment on its practicability.

Perpetually Flying Plane

(1194) Edward P. Conlin, Avon Park, Girard, Ohio, has designed an airplane in which there are several generators driven by air turbines. These generators produce electrical current which in turn operates electrical motors and propellers.

A. 1. The only and most unfortunate



This inventor believes that the air pressure can be used to operate a turbine, and this in turn will drive generators, the current thus produced to be used for operating the propeller motors.

part of your system is that the airplane you have designed will not operate. There would be no need of even a gasoline engine on such a plane; you could merely face the plane into the wind, generate current and make this current drive the motors and propellers and they in turn lift the plane, and if it were possible, your speed would increase constantly, because the faster you travel, the more current you would generate, the faster your

(*Continued on page* 648)

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Patent Advice

(*Continued from page* 646)

motors would run and hence, the greater would be the speed. Judging from this, you would soon be able to travel even faster than light.

From a theoretical standpoint, there does not seem to be anything wrong with the argument; from a practical standpoint, it simply will not operate at all.

Remote Control

(1195) B. A. Wentegart, Bronx, New York, asks whether it would be a good idea to patent a system whereby any radio set could be controlled from some remote point. He wants to know what advantages such a system should possess.

A. 1. Many systems for the remote control of radio sets have been advanced Some of these have been described heretofore in SCIENCE AND INVENTION magazine. The difficulty with devices of this type is that they do not do the work efficiently and they require cable wiring which the average individual will not make. Any system that is to be used and that can be practically sold on the market should be so contructed that it can be attached to the dial control of the radio set by means of a thumb screw.

No more than one pair of leads should be employed, and if possible no leads at all should be used. Even this type of circuit has been described heretofore but none of these methods seem to meet with a favorable market.

In RADIO NEWS for November, 1929

POLICE RADIO ROUTS RACKETEERS—How the Detroit Police Department has equipped a fleet of scout and cruiser automobiles with radio receivers locked to the wave-length of the Police Department broadcast station, and what a year's experience has demonstrated as to the value of such a radio system in breaking up gangster operations.

A SHORT-WAVE TRANSMITTER THAT FITS THE AVERAGE HOME AND PURSE—Lieut. Wenstrom presents the constructional data for a short-wave code and phone transmitter of low-cost and—best of all—of such design as to involve no upsetting of orderly housekeeping ideas.

PRACTICAL POINTERS ON SOUND AMPLIFIER INSTALLATIONS—S. Gordon Taylor gives some valuable advice to the radio man who wants to add to his income by entering this profitable field.

THE VARIABLY-TUNED BAND-PASS—Second of a series of articles by John Rider, on Band Pass Filters; describing their use in tuned radio frequency circuits, and explaining the theory and practice of their design and construction.

THE MARSHALL PUSH-PULL SHORT-WAVE RECEIVER—A constructional article by Thomas A. Marshall, telling just how to duplicate the receiver which successfully pulled in strong signals over 2,000 miles of distance on waves as low as seven meters.

RADIO NEWS FLOATING LABORATORY TRIES OUT AN EXPERIMENTAL SMALL-BOAT RECEIVER—A report of progress to date, in designing a receiver which will furnish entertainment as well as navigational aid for the small and medium size cruiser.

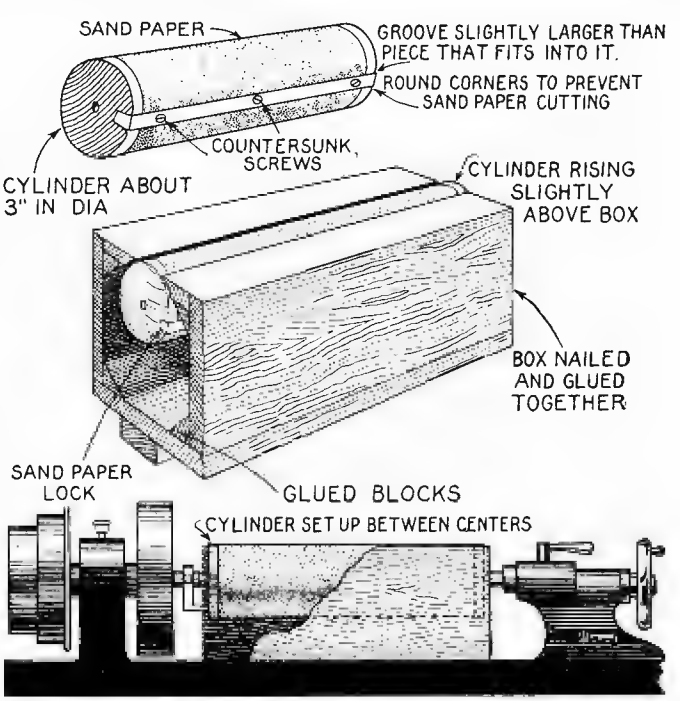
How to Sand, Grind and Polish on the Lathe

By H. L. Weatherby

(*Continued from page* 616)

THE writer remembers well that early in his woodworking experience, he was called upon to bore more than a thousand ½-inch holes in some oak bookshelves for adjusting pins. The only available machine with which it was possible to do this was a lathe, and so a chuck to hold the bit was purchased and mounted in the live center end of the lathe and the holes were bored in a short time. The chuck proved to be a good investment and, lacking other boring and drilling facilities, it has served many years for work in wood and metal.

For wood boring, a "Forstner" bit which has no screw center is most satisfactory, although a regular auger bit will do if the lathe is operated at slow speed and the screw threads are filed on the bit to prevent it pulling too rapidly. For long holes, such as are needed in lamp posts, it is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Constructional detail of the flat sanding cylinder.

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possible to use a long drill and get an absolutely true hole; by setting the drill in a piece of hard wood that is turned to the size and shape of and takes the place of the dead center. The work in which the hole is to be bored should be centered to the spur center and revolved slowly against the drill. A hole should already have been started by hand and the feeding of the drill should be done with the hand wheel. Frequent cleaning of the hole and cooling of the drill are necessary and when about half way through, the work should be turned around, re-centered, and drilled from the opposite end. The two holes will meet exactly in the center.

For drilling in metal a punch should be used, to center the drill. The work may be held against the drill by the tail stock with the center removed and fed to it by the hand wheel.

Grinding

ANYONE with a lathe need not want for an electric grinder. He can mount any sort of a grinding wheel that he may wish between collars, one of them to be a screw collar, that turns on to the headstock, as does the face plate.

Wheels of this sort have been known to burst, so a word of caution is needed. Do not operate at a higher speed than recommended, and do not stand in front of the stone when it is revolving. The tool rest for the lathe may be used on which to rest the tools while grinding them and a can of water should be near at hand into which the tools should be dipped from time to time for cooling.

Polishing and Buffing

FOR polishing and buffing metal surfaces one may make up a wheel of several thicknesses of canvas sewed together. For finer work a similar wheel of muslin may be used and for coarse or first polishing a wooden wheel, covered with a band of leather will suffice. A polishing or buffing compound of emery, carborundum, or pumice for this purpose should be applied to the under side of the wheel in motion. The wheel is mounted in the same manner as the grinding wheel. The work should always be held against the bottom of the buffer and the speed of the lathe should be from two to three thousand revolutions per minute. For small lathes wheels of about three-inch diameter should be used.

Scratch brushes can be purchased that will do for rough work and special brushes for carbon removal can be had for automobile work.

Veining

AT present veining is a popular means of decoration for panels and broad surfaces on furniture. Usually it marks the line between different tones of color in the finish. A friend of the writer's devised a very simple but very effective little veining tool by filing the head of a number ten flat head wood screw in such a way that it formed two cutters. This was mounted in the chuck and by using a temporary guide, very satisfactory veining was done.

It is quite likely that with specially devised cutters, mounted on shanks, some moulding and moulded edging could be done on the lathe. We would suggest to the reader that he experiment with his lathe, and he will find it one of the most useful pieces of machinery imaginable.

Next month we hope to give the readers of Science and Invention some worth while Christmas suggestions in the way of turned articles, and things that go with turned articles.

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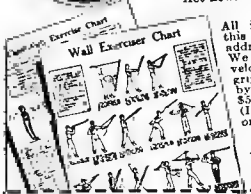

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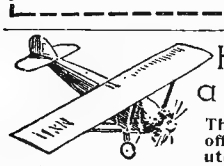

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Answers to Scientific Puzzles

(*Continued from page* 610)

Steam and Salt Water

Passing steam through a solution of salt in water will raise the temperature of the salt water above the normal boiling point of water. This is because the salt tends to make the steam condense. In condensing, the steam gives up a quantity of heat (latent heat of vaporization) which raises the temperature of the solution above that of either the components that are being mixed.

A Bottleful of Fog

Most gases and vapors become cooler when they expand suddenly. If the air in a bottle is already saturated with air moisture any cooling effect will tend to make the vapor condense into little droplets which we call fog. The compressed air in the bottle soon becomes saturated with moisture. When the stopper blows out, the cooling effect may be sufficient to cause condensation, especially if a little smoke is present to afford particles upon which the drops can condense.

Two and Two

Some liquids such as water and alcohol contract when mixed, so as to produce a volume that is less than the sum of the two volumes taken separately. Thus two quarts of water, plus two quarts of alcohol, do not make four quarts of mixture, but about 3.8 qts.

The Weight of an Hour-Glass

An hour-glass weighs the same when the sand is flowing as when it isn't flowing. The loss in weight due to the sand that is in the act of falling is exactly counterbalanced by the force which the falling sand exerts on the bottom of the glass.

Singing Chords

It is an utter impossibility for a person to sing a pure note of but one frequency. If he did he would sound like a tuning fork and his voice would be considered devoid of quality. Analysis shows that every note we sing and every syllable we speak is a composite note made of a large variety of frequencies. These various notes are called "overtones" or "partials". Their frequencies and relative intensity determine the quality and apparent pitch of the whole. Most of the principal overtones are harmonious and thus form chords. A few of the weaker ones are dissonant, but usually pass unnoticed.

Fanning a Thermometer

Fanning a thermometer will not cause any appreciable change in its reading unless the thermometer is wet. Increasing the circulation of air then increases the rate of evaporation and thus cools it.

The Power of a Washing Machine Motor

The armature of every motor develops an electromotive force that is opposite in direction to that of the applied voltage. The difference of these two electromotive forces largely determines the power that

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will be drawn by the motor. If the motor is running slowly, as it does when laboring with a heavy load, the *back-electromotive force* is small and consequently the effective voltage driving the motor is large. Consequently the motor under this condition will draw more power than when it is running freely under a light load.

Is the Sea Level?

Sea level is by no means the same over the surface of the earth. Nor is it the same throughout the same latitude, even after temporary changes due to tides have been taken into account. The coast of California is about 8 inches higher than the coast of North Carolina. Difference in temperature over various parts of the earth, together with the rotation of the earth, are largely responsible for great ocean currents. The direction and magnitude of these are again modified by the shape of the various continents and the depths of the ocean. The sea level at any spot is thus seen to be the result of a number of conditions that are far from uniform over the surface of the earth.

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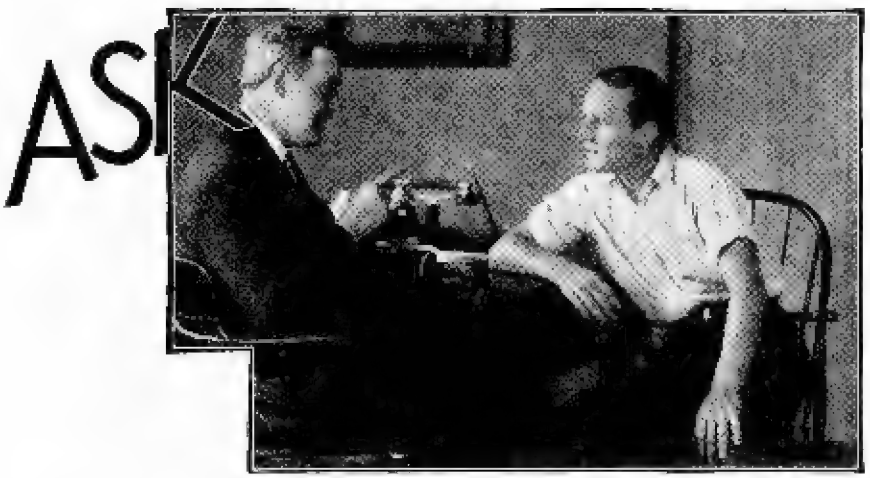

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The first chance you get to have a heart to heart talk with your "BOSS" ask him how YOU can get a $3.00 or $5.00 a week raise.

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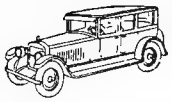

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Glands—Monkey and Other Kinds

By Dr. G. H. Estabrooks

(*Continued from page* 608)

with one which is only half active. As a result of this the child grows up feeble-minded. This particular type of mental defect is called cretinism and the child a cretin. The picture he presents is one which is easily recognized by anyone who deals with the mentally defective. He is always very short, with a yellowish, sickly skin. His hair is scarce and falls out easily. Sexually he is always quite undeveloped and his muscular strength is very small. Perhaps the most characteristic physical trait is the "pot-bellied" appearance of his abdomen, while mentally he is always feeble minded.

It is a very strange fact that we can get exactly the same results in the psychological laboratory in our work with animals. Thus if we cut out the thyroid gland in young rats we get the same picture of an undersized, weak, "pot-bellied" creature as he grows up. Likewise he is feeble minded. "How in the world," you ask, "can a rat be shown to be feeble minded?" Quite simple. Any ordinary rat can learn to do certain tricks such as finding his way out of a complicated maze to his food box. In this way we measure his intelligence just the same as we measure a child's by means of intelligence tests. But we find that a rat which has lost its thyroid glands at an early age—is thyroid-ectomized, we say—simply cannot learn these little puzzles as can an ordinary rat.

However, his plight is not hopeless. In his case and in that of the human child we have learned to inject thyroxin into the blood stream. Thyroxin is made from the thyroid glands of certain animals and when we give this to a child it takes the place of the normal secretion. By this means we can completely cure him of his feeble mindedness and he will develop into just as normal an individual as yourself. But the treatment has to begin early and has to continue during his whole life. By injecting this thyroxin you are simply supplying what is lacking. The moment you stop there will be a relapse.

Then you must look on the thyroid gland as a little still within the human body manufacturing a drug which peps the body up and keep it running. Any time it ceases to work the entire machinery slows down. In the adult individual this gland may become injured by means of a tumor, by tuberculosis, or by other causes. Immediately the individual loses his pep, becomes lazy and listless, starts putting on fat and soon has not sufficient energy to even feed himself. Here again thyroxin comes to the rescue and restores the individual to his normal existence.

This is one side of the story. There is another which is equally interesting. Sometimes, why we do not know, the thyroid gland becomes over-active. This is seen in exopthalmic goiter. There are several kinds of goiter, by the way. In this particular type the thyroid gland becomes too industrious and starts secreting too much thyroxin. This is just as if the patient were given some very stimulating drug. He becomes over-active. He is continually on the move and will not even take enough time for sleep. As a result he simply wears himself out and will die of exhaustion if something is not done. Actually, if the gland will not calm down there is only one thing to do, namely to operate. The gland is removed, all but a little piece of it, and we hope that what

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is left will be enough to supply all the bodily needs. If not, thyroxin is given to make up for the lack.

The Parathyroids

NEAR the thyroid are four glands about the size of grains of wheat. These are the parathyroids and in spite of their tiny size they are very important. If they are removed the patient will die. This is frequently done in the laboratory on various animals and they always die of parathyroid tetanus, a peculiar disease wherein the animal has fits and stiffening of the muscles. Their exact function is not known but the drug which they secrete seems to act in a calming manner, as would morphine. An animal in whom they are removed behaves as if the brakes were taken off and literally wears himself out, finally dying in fits and convulsions.

It is very interesting to watch the battle between science and these various diseases. Ever since 1900 the physiologist has been hot on the trail of the parathyroid. Just how could an individual be saved in whom these glands had been destroyed by disease? As usual, science began by trying out various cures on animals, especially white rats. It was soon discovered that by certain means an animal could be kept alive for a few weeks after the removal of these glands. Finally, as late as 1924 a Dr. Collip discovered parathyroid extract which will save the life of the individual who has lost the parathyroids. It is a very peculiar fact that if his life can be saved for a few months the body then learns to exist without them and he can live normally from that time on.

The Pituitary Gland

PERHAPS the most startling of any of these glands, in some respects, is the pituitary, situated in the brain. This very interesting gland seems to control the growth of bones. For instance, in some people it becomes over-active and as a result of this the bones grow too large. This is the case in our classic giants. When these huge people are examined after death it is then found that the pituitary gland is enlarged and has been pouring too much of its particular

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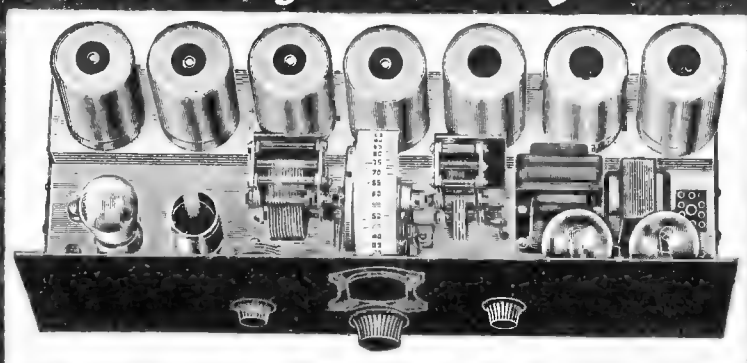

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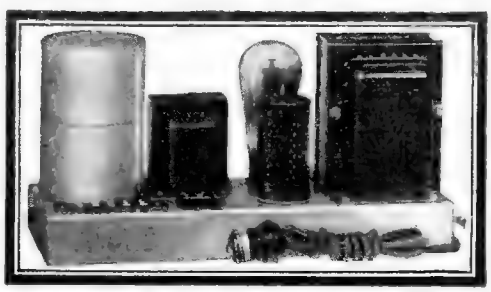

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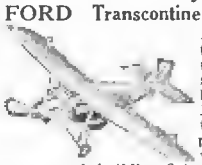

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drug into the body. Now, it sometimes happens that this gland behaves quite normally until the individual has grown to adult life. Then, for some reason or other, it suddenly takes a spurt. The results would be funny if they were not tragic. You see, the bones have already stopped growing so they cannot start again and give us a giant. Unfortunately the bones of the hands and feet are the last to stop and these seem capable of further growth until well on in adult life. So when the pituitary becomes over-active in the grown-up individual his hands and feet start growing. The result is a peculiar disease called acromegaly in which the sufferer has huge hands and feet which are out of all proportion to the rest of his body. Besides this control which the pituitary gland exercises on bone growth it evidently has other functions, since its removal in animals always results in death.

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The Adrenals

TWO of these ductless glands are interesting survivals of a time when man lived by tooth and claw. These are the two adrenal glands, one situated just over each kidney. They have been very aptly called the "emergency" glands of the body. You see, your body is more or less of a machine which runs on somewhat the same plan as an auto. Ordinarily you are jogging along at a comfortable rate but every now and then a Ford passes you, whereupon you step on your accelerator, pray a kind heaven that there are no state police in the vicinity, break every known traffic law and roar past your tormentor in ridiculing contempt. We refer, by the way, to the old type Ford.

It is exactly the same in the human body. Here the stimulus is not a college Ford but any one of the great emotions, especially fear or anger. Fifty thousand years ago fear or anger meant danger, meant an emergency. If it was fear you were going to do a hundred in ten flat with a cave bear on your heels, the loser to supply the eats. If it was anger you were going to seize your trusty club and show a brother tribesman just exactly where he stood on certain little matters of etiquette. In any case you were going to need every ounce of physical strength, you were going to "step on the gas," so to speak.

So the moment you feel either strong fear or anger a message is sent to the adrenal glands and they immediately pour into the blood a substance called adrenalin This substance has a very strong and quick effect on the entire body. It prepares you for violent physical exertion. In the first place it causes all the digestive tract to stop work. That is so you may not be putting any energy into such trifles as digesting your last meal when you have more important work to do. Then it starts your heart beating more strongly so as to get more blood to your muscles, and your lungs start working faster so as to get a better supply of oxygen.

Most important of all is its effect on the liver. This organ is, among other things, a big storehouse for sugar, and sugar happens to be the fuel on which the muscles feed. The liver is thus a sort of gasoline tank for your body. Adrenalin acts on this and causes it to pour more sugar into the blood. The heart is already working overtime, so that as a result of the action of the adrenal gland, your muscles not only receive more blood but that blood contains more muscle fuel or blood sugar. Not only more gas but a richer mixture, so to speak. Consequently you can see that the strength of fear or of madness is no idle myth. The individual can literally do feats under strong emotion which he could never attempt in the normal state.

It is very interesting to note that one animal has very tiny adrenal glands. This is the skunk. For him there are no emergencies, no occasions for great bodily exertion. Just a contemptuous flick of the tail and all his arguments are settled in a perfectly satisfactory manner—for him.

The adrenal gland, however, is a hangover from times of savagery. Today when you become angry the adrenal immediately starts working and among other things stimulates the liver to pour more sugar into the blood. Ten thousand years ago you burned up that sugar by means of violent physical exertion. Now you do nothing and the sugar simply remains until it can be removed. This removal is the work of the kidneys. Consequently they have to do extra work in addition to what

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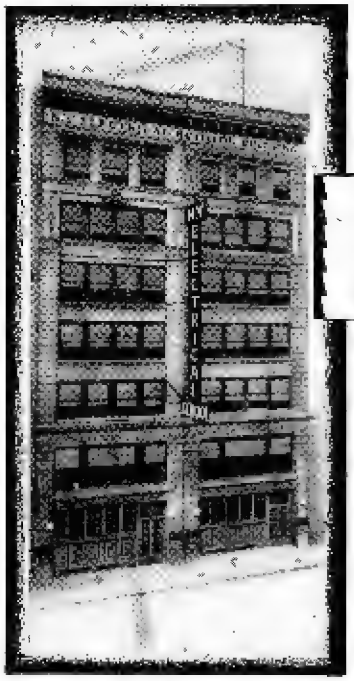

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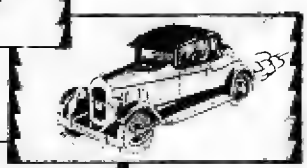

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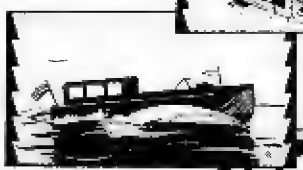

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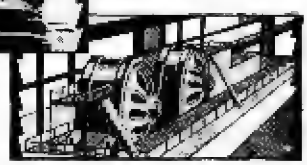

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they are already doing. This overloads the kidneys, keeps them working at high pressure and is without doubt one cause of certain kidney diseases.

The Gonads

THE last of the ductless glands which we will consider are the sex glands. One part of these, called the interstitial cells, give an internal secretion and are in no way connected with reproduction as such. It is to these particular cells of the sex apparatus that we refer when we talk of treatment by means of monkey glands. Actually, as we will see, such treatment is still a very long way from being proven useful.

As you well know from your observation of animals, the loss of these glands has a very bad effect on the individual. While we generally see such results only in the case of the male, we would get the same picture in the female should these same glands be removed. Our best example in nature is the contrast between the male horse in which they have been removed and the animal in which they are still intact—the stallion. The latter presents to us the picture of masculine beauty and strength, the other is simply the everyday drudge in front of the coal wagon, lacking fire and energy, simply a slave of work.

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Castration, or the removal of these glands in the human being, gives much the same result. The man grows to maturity lacking all the qualities of manhood. In physical strength he is far inferior to the normal individual, and his voice always remains high like that of a woman. Strange to say he never even develops a beard which is so troublesome to mankind in these days of safety razors and shaving lotions. After all, there appear to be consolations for every condition.

It is interesting to note that with these glands removed the voice never deepens. For this reason it was once customary to castrate choir boys who had very fine soprano voices, in this way making certain that they would not be lost to the church choirs. Indeed, this habit of human castration was once very common. Slaves who worked around the harems of the East were always so treated and were then called eunuchs. It appears to have been a common custom with a large percentage of all slaves in some societies, and it is very possible that in very primitive peoples the leader of the group may have castrated all the younger male members so as to be sure of his authority. There is a certain amount of evidence which points in this direction.

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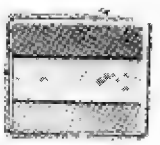

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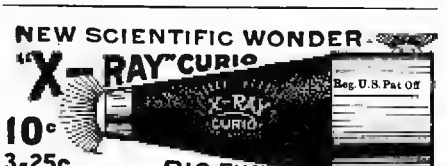

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ments on which to go. Thoreck has shown that the glands from a human being will function in an ape. Voronoff claims to have proven that a sheep which is old and feeble can be rejuvenated or made young again by having the sex glands from a young and vigorous animal grafted into its body. This subject is one which excites great public interest, and like all such questions is very difficult to answer in an unbiased way. Here again, however, we must try it on the rat. If we are able to show that such treatment can make young again rats—or any other animals—after they have reached old age, we should have some basis on which to hope that the same will apply to the human being. Such experiments have not as yet been carried out. I understand, however, that Slonaker at Leland Stanford University is making a serious attempt to solve this problem of rejuvenation by means of grafting of sex glands. He is working with rats, but his results have not as yet been published.

I fear that all this talk of the peculiarities of various glands in your body may leave you in a state of wonder that you are still alive. Actually, nature takes care of these things in very fine fashion. The glands are very important, to be sure and any trouble with the least of them has prompt and terrible results. But not one in one thousand of my readers need have the least worry. All you need with reference to these glands is a "scientific ignorance" as some one says. Let them alone and they will do their work smoothly and well. The surest possible way to cause trouble is to begin meddling. A great many people on reading of these glands promptly get the idea of injecting adrenalin or thyroxin to pep things up. But your blood be on your own head if you try it.

Nature has established her own balance. You tip the scales by your interference. Sometimes you may very easily tip them so far that neither nature nor the doctor can right them and death ensues. Thus certain medical men were in the habit of injecting thyroxin in large quantities to overcome what they thought was a lack of this secretion from the thyroid gland. Actually they excited the gland to such an extent that it could not stop secreting and all the symptoms of exopthalmic goiter resulted. Only the entire removal of the thyroid saved the patients' lives.

So let nature handle these little trouble factories as she sees fit. Don't be carried away by tall stories of the wonderful results which will come from taking some form of gland treatment. There may come a time in your life when one of them becomes diseased. Then it is a problem for your doctor. But normally the safe motto is "hands off." Modern science is teaching us two lessons about the ductless glands. The first is their great importance to the body. This I have tried to describe. The second deals with the very grave danger of meddling with their work and so upsetting the balance which nature has established.

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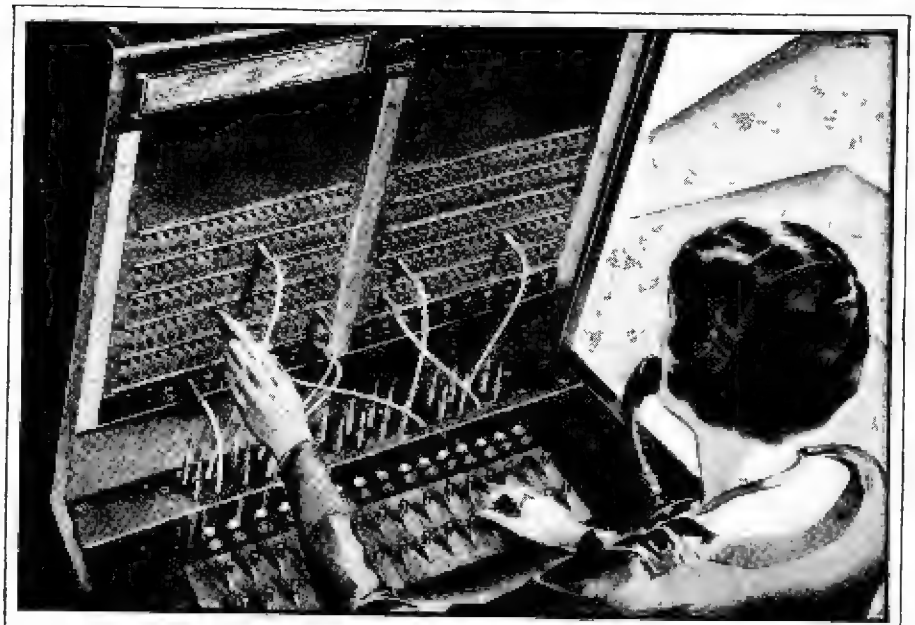

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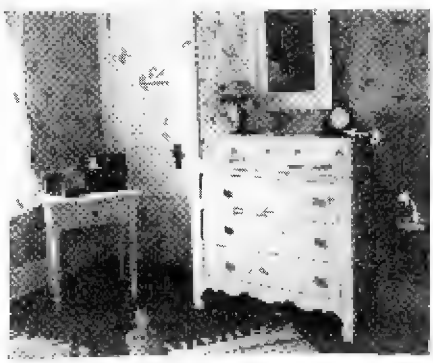
You Can Make These Electric Servants

By W. R. Pyle

(*Continued from page* 619)

tiring in a cool bedroom in summer and arising in a warm one in winter.



The automatic window closing device is shown above. 1 is the window release, 2 the knife switch, 3 the clock, and 4 the register opening solenoid.

This control mechanism is shown on the small table in the photograph. It regularly rests on a shelf inside the wardrobe.

It consists of a clock, knife switch and a solenoid with a movable plunger mounted as illustrated in the diagram. The solenoid is a helical coil of about 300 turns of No. 18 insulated wire wrapped on a wooden spool. The plunger is a soft iron rod 5/8" in diameter.

A similar solenoid and plunger are mounted both under the window casing and on the heat register as shown in the diagram. The white knob at 1 in the photograph is for inserting the plunger into any one of several notches in the window sash.

Since on retiring the window is raised and the register closed anyhow the only additional effort to set the mechanism is to lift the arm on the clock about 1/4", close the knife switch and place the plungers in the position shown in the drawing.

At the time the clock is set, say one hour before arising, the alarm arm rotates and puts 115 volts across each solenoid. All of the plungers are instantly pulled in, thus simultaneously tripping the heat register and releasing the window, which by means of specially balanced sash weights slowly closes due to gravity. A fraction of a second later the control plunger has taken up the slack in the flexible cord and has opened the knife switch, which breaks the current to all of the solenoids.

The writer has a self-regulating furnace, which makes it only necessary to open the register and close the window in order to arise in a comfortable room.

This mechanism could be used to open the drafts of an ordinary furnace if so desired.

The range of usefulness of the control mechanism could be extended by putting a little ordinary table salt in a small, inconspicuous non-metal container fastened just outside of the window with wires connected to it as shown in the diagram. Then if rain should start to come in at the window the salt would be dissolved making a conducting electrolyte and the solenoid plungers would release the window and open the knife switch.

Since this mechanism uses current for only an instant the meter is hardly moved and the cost of operation is not noticeable on the monthly electricity bill.

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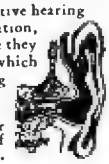

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An electric fan cut-off is shown on top of bureau in photo. It consists of two triple plugs and a knife switch, the latter being opened by a brass arm screwed on the alarm winding shaft of the clock. The bell clapper is removed from the clock so that the fan will be noiselessly stopped at any time for which the alarm is set, which is generally two or three hours after one has gone to sleep.

Other Electrical Conveniences

A FEW other installations in the writer's home are as follows: a master switch at the head of the basement stairs controlling all lights in the basement plus a small red pilot light in the kitchen telling when any basement light is burning; automatic lights in the cloak and the kitchen closets which are turned on when the doors are opened and off when they are closed; and an abundance of three-way and four-way switches which makes possible turning the light off behind and the one on ahead no matter through which door in the house one passes.

Three switches control the electric light in the garage, one of which is within reach from the driver's seat, another near the side door of the garage and the other is inside of the house.

Sixty-one outlets (plugs, switches, etc.) in a house with six rooms, bath and basement have proven indispensable for the efficient use of about a dozen common electrical appliances in addition to the above mentioned devices.

The writer has designed, made and installed (during construction of the house) all the devices herein described and they have been in use for some years without any repair expense.

Cost of "Electric Servants"

THE actual costs (no labor charge) were approximately as follows:

Electric Baby Rocker	$3.00
Motor for same (second hand)	6.25
Electric Garage Door Control	10.00
Motor for same (second hand)	6.25
Electric Fan Cut-off	50
Electric Solenoid Mechanism	4.00
Alarm Clock	1.00
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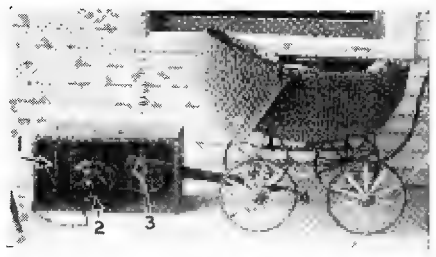

Baby is rocked to sleep by electricity with the device shown above.

Almost all of the material used was second-hand as the chief aim was to obtain maximum convenience for minimum outlay.

It is great to let the invisible servant keep the garage doors closed while you are gone and to prevent you from getting out in the rain, sleet or snow to open or close them (the pressing bill saved will pay for the apparatus). Furthermore, this servant will "walk" the floor with the infant, keep you asleep on a hot night and get you up in a warm room in winter. Who will object to such par excellence service?

Should you have any difficulty in making your "electric servants" work, Mr. Pyle will be glad to help you. His address appears at the head of this article.

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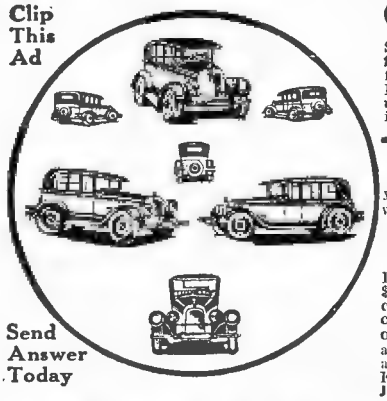

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Relativity and Common Sense

By Donald H. Menzel, Ph.D.

(*Continued from page* 613)

In thought you can see solid objects. You can imgaine them to be in motion. But you cannot—even aside from limitation of memory—possibly picture all at once the entire history, say of a house, its construction, its long period of usage, its decay. It might look something like this (Fig. 2) only you

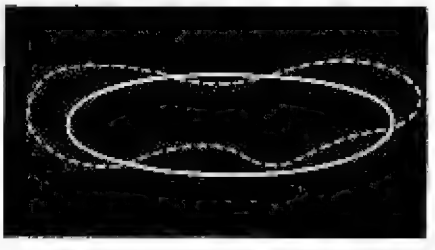

Fig. 3—The layman says, "Here is the earth's orbit. The actual path is nearly circular. Surely this wiggly line I have drawn outside it is longer than the true path."

should be able to see clearly every detail both inside and out continuously, where I have sketched a blurred shadow of the exterior alone.

P.—Then relativity's substitute for the law of gravity practically amounts to this: Every object so moves that its path between two points is of maximum length?

L.—That seems entirely out of reason. Here is the earth's orbit. The actual path is nearly circular. Surely this wiggly line (Fig. 3) I have drawn outside it is longer than the true path!

R.—There now! Right at the start you've forgotten what I just told you. Let me ask you some questions. What kind of orbit is this you've drawn?

L.—A spacial orbit.

R.—While a geodesic is——?

L.—I see. The geodesic is the track of the object in four dimensions. I forgot the time again.

R.—I sha'n't bore you with the mathematics of the problem, but the path you have drawn, while unquestionably longer in the spacial sense, is shorter in time. That may not seem logical, but the displacement will so affect our measuring apparatus—clocks and rules—that the path will be shorter, four dimensionally, than the present track which is the longest possible in space and time. The spacial portion of the geodesic or world line, as seen from the sun is the well-known elliptic orbit.

L.—Relativity doesn't seem to be so far removed from common sense after all.

R.—Personally I should say that relativity *is* common sense. But you are not the only one who is having difficulties. Here is a letter from one of my correspondents; this is the effect that my statement "Gravitation is an illusion," had on a certain individual.

"——*You must be intelligent enough to realize that what you're saying is utter nonsense. Here I am in Buffalo; there you are at Mount Hamilton. We both stick out from the earth in different directions. (Figure 4) Clearly there MUST be some force attracting us toward the center of the earth!*"

L.—I sympathize with the writer of that letter. It isn't easy for us who were raised on *gravitation*, to throw it completely overboard.

R.—Yes, I too sympathize, but your point of view, though manifestly human, certain-

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ly is not scientific. It is the scientist's aim to uncover the true nature of the universe, without letting himself be influenced by preconceived ideas of what he ought to find. Your attitude toward relativity is scarcely more charitable than that of the farmer who hopes that his neighbor's cows will die so that the price of milk will go up.

Why do you feel that gravitation is so fundamental—so obvious? Is not your faith in it due more to your being "raised on it" than because of its correctness? Remember that you learned about it when you were very young—at the age before your critical faculties were well developed? It is so easy to accept, as a child, the authority of parent or teacher, and the precepts or principles laid down at that time become so fixed in our minds, that it naturally becomes very difficult for us to accept any conflicting idea. If gravitation is so "obvious," why did science have to wait many centuries for a Newton to develop the conception?

P.—Nevertheless there is something about *gravitation* that appeals to the imagination. There is a sense of security in the idea that the earth is pulling us toward it.

R.—True. Perhaps part of the antagonism that has been exhibited toward relativity may be found in the familiar advertising slogan "Beware of Substitutes!" Under relativity, one may subconsciously cherish the fear that he may no longer walk with certainty—that on his very next step he may fly off the earth! Of course this is nonsense—sheer superstition—but superstition and prejudice are often the weapons of those who are unable to resort to scientific argument.

L.—But I can *feel* the pull!

R.—Are you sure? I grant that you feel something—but is it not the *push* of the solid earth against the soles of your feet rather than the *pull* of gravity? (Fig. 5.)

P.—But surely there is something that holds us to the ground! I don't see that it makes much difference what name you give to the force.

What Happens When You Fall Into a Well?

R.—My objection is still more fundamental. I do not deny the presence

Fig. 5—Is it not the push of the solid earth against the soles of your feet that you feel, rather than the pull of gravity?

of a force. As you say, you can feel it. But I deny that the force is a tugging of the earth.

Forget Newton's law and fix your attention on mine: all objects in the universe tend to follow a definite kind of path—a geodesic. Your geodesic intersects the surface of the earth, which, being solid, prevents you continuing in your normal path.

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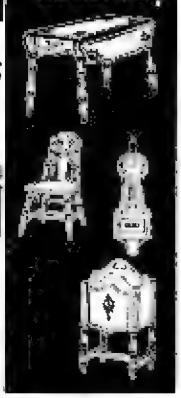

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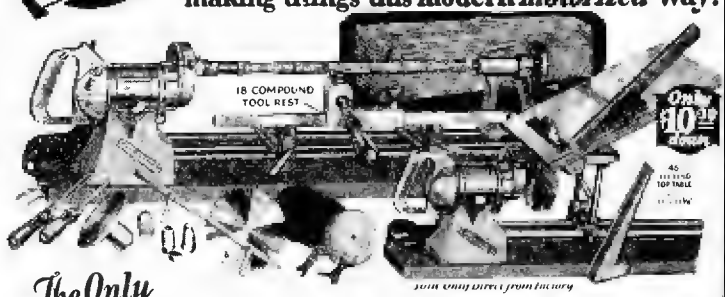

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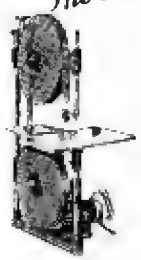

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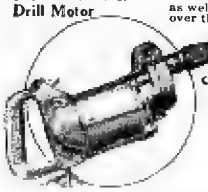

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The force is the push of the earth against the soles of your feet. Step into a well and the force vanishes because you will then be moving in an unobstructed path—a geodesic.

P.—According to gravitation the force is constant. In one case it manifests itself by pulling us against the earth. In the other it causes our motion.

R.—Logical but for one thing. Where, how, and why does gravitation arise? Suppose that a man, who has never seen or heard of a railroad train, is given the opportunity to ride in one. The train starts without a jar, and he does not at once become aware of the motion. Suddenly he exclaims, "Why, the earth is moving!" You immediately correct him. "It is the train that is moving. There is an engine up at the head that is tugging, pulling us along."

To our neophyte, unacquainted as he is with all manner of machinery, the name engine means nothing. He might think of it as a witch, or he might not visualize it at all—an invisibile force similar to our conception of gravitation.

He replies, "But I don't feel anything pulling me!"

P.—Of course not. After the train has started, the engine serves merely to overcome the friction of rails and wheels. If friction could be eliminated, once the train was in motion, the engine could be disconnected and the train would require no further pull. (Provided, of course, that the road-bed were perfectly level.) The presence of the engine is inconsequential.

R.—I grant your contention. Please remember, then, that mere motion is no proof that a force is acting. Now let us return to our neophyte's first ride. A great rock slide covers the track and the train suddenly crashes into it.

The man is thrown forcibly from his seat as the train stops, but he picks himself up, and, rubbing his bruised head, remarks, "There must be a devil in that engine. I certainly felt the tug that time. It was so strong it pulled me right out of my seat—" and you now are bound to explain that the force was not real, only apparent; that it arose from an obstruction in the natural path of the train. (Fig. 6.)

P.—I begin to see the truth of your analogy. The track represents the geodesic.

R.—Yes. As long as the train or a falling body moves undisturbed along this path, no force is required. It does not even exist. When an obstacle—the pile of rock, or the solid earth in the second instance, intervenes, one may *think* he feels some sort of gravitational attraction but it is an illusion produced by the presence of the obstacle.

L.—I have a question. The man in the wrecked train, after the first shock, no longer feels the force, whereas a body at the surface of the earth experiences a constant "pull," be it mythical or not. Why this difference?

R.—That is a defect of the analogy. The clearing away of the rock debris will not of itself set the train in motion again. But if a hole is dug in the earth, any object lying in it will gain motion from the removal of the obstruction, alone.

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Mediumship the Science of Invented Hokum

By Herman D. Wagner

(*Continued from page* 597)

I turned from the "big timers" to the lesser lights in the private circles, in the churches and in the homes. Here I investigated every phase of mediumship that is practiced, and again was chagrined at the insults to my intelligence, and the actual crudeness of those who are holding high honors in various Spiritual organizations and in the local "bright lights" who hold their neighbors, friends and associates spell-bound in awe at their remarkable (?) powers.

Next I joined and attended regularly "developing classes" throughout the country in an effort to privately reveal to myself the methods employed by these mediums to fool the public. I had not long to wait—for in many instances my real name was never known. In a western city I joined a "trumpet developing class" under the name of Jones. Immediately I received actual voices in the trumpet from Grandpa Jones! Poor Grandpa Jones had a pitiful time explaining to me why it was that he had never seen me "in the flesh" or why I had never seen him. At another meeting in a West Coast City I introduced myself as a devout spiritualist by the name of H. D. Wilkins. At this particular meeting a voice approached me saying "Hello Howard." I did not answer, because it was not my name. Someone kindly informed me that the voice was speaking to me. "But that isn't my name" I insisted. "Well it should have been" the voice said, "Your mother wanted to name you Howard but Dad objected. By the way what did they name you?" I decided to give out no "leads" so I said "Never mind, you know my father died 7 months before I was born, but who are you?"

"The —— you say," the voice said, "That's right—it was too bad wasn't it? Of course we are glad to have him here with us but you have had a hard time, haven't you?" The real fact is my father is living to this day and has no expectation of becoming a "spirit" soon. "Who are you?" I asked again. "Don't you know me?" I was asked. "No, I don't, I'm sorry," I said. There was no alternative, for I would not let him avoid the question so he had to say "I'm your Uncle." I replied in surprise, "Oh is that you Uncle Ben?" "Yes, yes" in a relieved tone, "Your Uncle Ben Wilkins." I arose from my chair and said, "Thank you so much. In the first place I have no Uncles alive or dead, and in the next place my name is not Wilkins" and with that I flashed on the lights. The medium was leaning over in her chair holding the trumpet to her mouth which a moment later, she tossed into the air. There was great confusion and the meeting broke up. This particular medium retreated into obscurity and the whole affair was quickly "hushed up." I attended other *trumpet séances* in that city and elsewhere with practically the same results.

Materializations

NEXT I investigated the "materialization" farce. The medium goes into a cabinet or behind curtains and "spirit forms" are supposed to emanate therefrom that you should recognize. At all of them most of those present "recognized" various dead friends and conversed with them, some of them actually fainting, crying or carrying on frantically at the "uncanniness" of it all. The medium is supposed to be seated in his or her chair behind the

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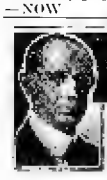

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drapes either in a "trance" or not, most of those at the circle think he is in a "trance," and never leaves the chair during the performance. In several instances I appeared to be overcome with emotion at seeing some "dead relative" and would fall forward and grab the "Spirit" which turned out to be the "medium" draped in a thin silk gauze vaguely visible in the very dim red or green light used in the room for this purpose. I have been threatened with arrest and all manner of threats for breaking up a séance in various private homes, but they have never done so yet because they know they would have to give genuine proof of spirit materialization and that they cannot do.

"Transfiguration" is the form of "mediumship" where the medium's features are supposed to take on the features of dead persons and you are supposed to recognize them. In all such demonstrations I saw no change in the medium's face whatsoever, even though others in the room claimed to have seen wonderful changes take place, and I attribute this phase to a warped imagination on the part of the spectators, who really are weak enough to believe they are seeing something which they do *not* see. If there is a real transfiguration of the features, then everyone should see that change take place, and when everyone does not see it, it is in my estimation purely imagination on the part of the on-lookers. And I actually believe that some mediums have been "kidded" so much by these silly creatures who think they see some change take place, that they actually believe themselves that it is a form of mediumship.

The Developing Classes

FINALLY I ventured into the Clairvoyant Circles and developing classes. Various mediums have brought back to me my mother, father, brothers, sisters, who are supposed to be in spirit and delivered messages from them to me. Each new medium has given me some new kind of a "Guide"—sometimes I am favored with a Hindu, at other times an Indian, or an Arabian, or a Doctor, lawyer, priest, etc. I often wonder why the "forces" cannot tolerate me for long and it becomes necessary to give me new ones and different kinds all the while.

After convincing myself that it was all bunk, I pretended to suddenly "develop" my own powers and "gave out" various messages that were declared to be marvelous. It was all very easy. By listening to the conversation of various persons with others, noting some things they told about themselves or their friends, and making a mental note of it I could get the "low-down" on all of those who were present from time to time. At the next meeting or perhaps two or three weeks later I would bring this into their reading after having camouflaged it just enough not to appear a direct repetition, and so strongly impress them and give them great confidence in my powers. Often it is possible to get information about certain persons who have never attended the meetings through someone who has invited them and by carrying on a natural conversation with the person who knows them. If many mediums were more observing of minor conversations than they are they could be even more famous than they are at their trickery.

It is an easy matter to describe spirits for nearly everyone has a relative in the "spirit world" who looks a great deal like them, and the medium is reasonably safe in slightly altering the description of the person receiving the message—for they are quite sure to recognize someone of that description. If you describe a spirit

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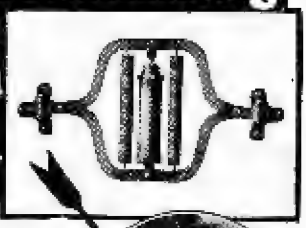

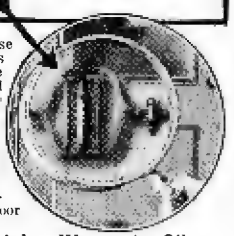

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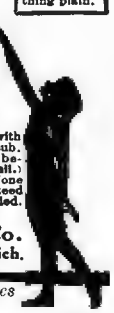

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they do not recognize why it can always be switched off to be a playmate in your childhood days, or a friend of the family in earlier days, or perhaps even a stray spirit who has been attracted by their pleasant personality. It usually goes over very well and satisfies them. And of course many people can "recognize" a spirit with a uniform, for many have either relatives or friends who were killed in the World War or perhaps in the Civil War. The expressions on the faces of those receiving the reading and the ejaculations they make lead the medium on to other and greater "convincing" tests.

After establishing the fact that I was a "gifted person" I have seen many people go out into the world and give messages that they believe they are getting thru a "Spirit Guide" whom I have given them. I told a lady in the middle-west that she had a very strong Indian force by the name of "Shootin' Star" and she is today holding séances and using this "Guide" as her helper. He even "talks" thru the trumpet, when some fake medium comes to town and learns that she has a Guide by the name of "Shootin' Star." Others will come to me and tell me they SAW and CONVERSED with their Guide, and had it not been for me they could perhaps never have found out who their Guide was.

I Give Successful "Trumpet" Séances

THEN I tried my "hand" at broadcasting through the trumpet. A sensation was created when the announcement came that I had "gotten" the trumpet phase. After holding several dark-room séances with wonderful results, wherein nearly everyone present actually "recognized" a voice and chatted intimately with "relatives," it was simple to see how easily some people can be fooled. A slight change in the tone and pitch and in conversational characteristics makes a decidedly different sounding voice thru a tin trumpet and my audiences readily recognized their loved ones.

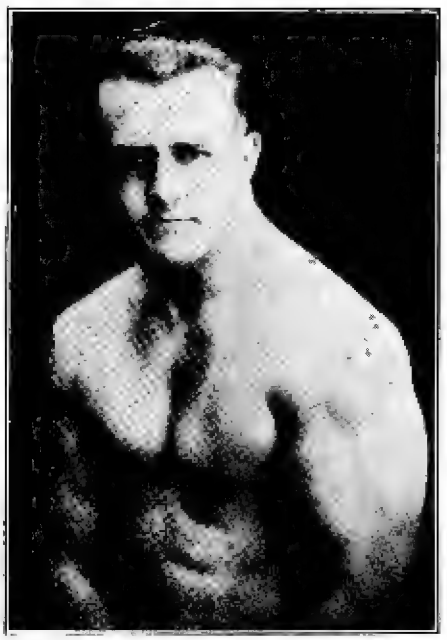
At my last trumpet demonstration, when there were several supposed - to - be "mediums" present after the performance, I revealed that it had been faked and surely stirred up a hornet's nest for I was cursed, threatened and sneered at. However, these same mediums a moment before declared it wonderful and when I told them that if they were real mediums, God would not let them be faked and would have put them wise, they became furious. For several days threatening letters poured in at my hotel advising me to leave town or "I would be done away with."

How "Spirit Photos" are Produced

SPIRIT photography while not so common as other phases of mediumship also has its tricks. I have never received, as yet, a spirit photograph from a stranger which had any spirits I could recognize photographed thereon. Of course one recognizes the face of Christ as He is supposed to have looked and His face was usually on most of them along with others whom I did not know. But when getting photographs from those I know I would have pictures of relatives dead and living thereon. The method is very simple.

I demonstrated the method to some of my friends and they were "staggered" at the simplicity of it after it was explained. After producing spirit photographs for several people I knew I offered to photograph anyone I did not know and guaranteed to have spirit pictures on the photograph that they would recognize. I was

(*Continued on page 667*)



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Your heart, your liver, your kidneys, your lungs—all your internal organs get the jolt of their young lives when I start to work on them. And they settle down to an orderly, well-mannered existence that means a new kind of happiness for you—the joy of living that only a healthy, virile body can give you. And the headaches, constipation troubles, aches and pains that are always caused by weakened, flabby bodies somehow miraculously disappear.

You See It in Her Eyes

And will your friends notice the difference? Just watch that girl you love so dearly fight to hold your attention! And the boys in your crowd—they'll look up to you as a real leader. Instinctively they worship strength and the leadership that must go with it. But let me tell you all about it.

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Mediumship the Science of Invented Hokum

(*Continued from page 665*)

not supposed to know who it was they had selected for the sitting. A friend of mine who was wise to my investigations found out from some member of the committee who did the choosing whom it was that they had selected.

The next day my wife called at this person's residence, presumably selling a new carpet and rug cleaner. The lady was not interested and did not wish to buy any. But by carefully planning her talk my wife secured the privilege of a demonstration. The lady admitted her and during her absence to the kitchen for an old dish and some water to dissolve the powder in, my wife took a miniature "police camera" from her handbag and quickly snapped several large pictures hanging on the walls of the room. It was a large, well lighted room, and had several enlarged pictures of deceased members of the family hanging on the walls, as almost every home has. The demonstration was soon over and my wife took her leave without the least suspicion as to her real reason for entering that house.

When the lady appeared for her sitting I photographed her in the usual manner. After making a print of the negative, I pasted prints of the small photos made with the police camera around the head and blended the edges into the back-ground and re-photographed the print. When this second negative was developed it had the "spirit pictures" on it and was delivered to the person with her picture.

In my investigations I have seen twenty-two insanities take place thru the cause of mediumship alone, and there are perhaps more insane persons in the public and private institutions put there from this cause, than is generally supposed. This cursed trickery overwhelms the poor, little weak minds in it's unexplained uncanniness, so that the warped imagination becomes overpowered and the person believes themselves "obsessed" by evil spirits.

Many mediums refer you to the Bible for proof of spirit return. We read in Revelations 1:10 "I was in the Spirit on the Lord's day, and I heard behind me a great voice, as of a trumpet," etc. and in Acts 8:39 we have what the Spiritualists like to call "Levitation." And in all there are some sixty-eight references to which they call our attention to prove that the "dead do return"; but in none of them does it say the phenomena was accomplished in a *dark room* nor that it was *faked!* According to the number of mediums there are scattered thruout the world this mediumship business is a common thing and one that any vagabond or unholy person can accomplish.

If it is a genuine and possible thing let them come forward and prove it. There is a nice little fortune offered by SCIENCE AND INVENTION for positive proof, as well as other attractive awards offered by various societies thruout the world. Why do not these who claim such marvelous powers take advantage of these awards. Can it be that they are so rich already that they scoff at such offers? No, it is not so! They cannot produce the *real* results and they know it. *It is impossible.*

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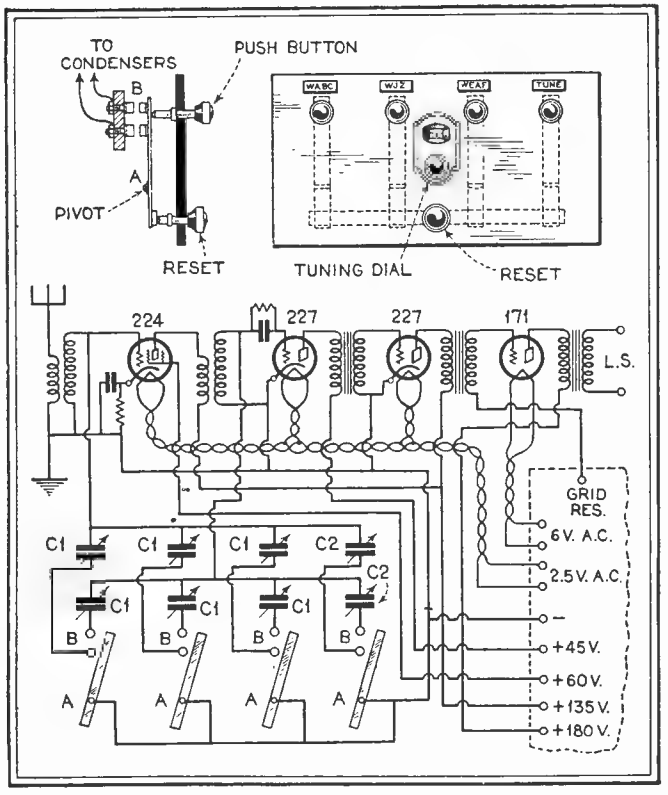

Fig. 4—A complete push-button radio receiver, making use of semi-variable condensers to tune in the station. (Suggested by Beryl Bryant.)

(*Con. from page* 631) requires no great electrical or mechanical knowledge to construct. It is foolproof in operation. All that it needs is some strip brass, a couple of gears and discs, some ¼-inch brass rod and a length of thinner rod for the pin. The stops are made from binding posts. Any small knobs can be used on the set rods.

The remote control arrangement shown in Figure 3 makes it possible to be several feet away from the receiver and not have to undergo the annoyance of getting up to tune in another station. If the push-button lead is made longer, it will even be possible to control the set from the porch or another room. The drawing shows two different methods of constructing the reversing switch. It is connected to a universal motor as shown

A complete push-button radio receiver is shown in Figure 4. A conventional arrangement of parts is used. The condensers C1 are semi-variable mica condensers. Each group is adjusted to the wavelength of the station to be tuned in by corresponding push button. The condensers C2 are standard variable condensers and may be on one shaft to make a single control receiver. When the TUNE button is pushed, condensers C2 may be used to tune in distant stations. The set shown will work all right for stations several hundred miles away, but additional stages of radio frequency amplification should be added for greater sensitivity. It will be necessary to add one condenser to each group for each additional stage.

Automatic and remote controls greatly increase the usefulness of the radio receiver.

The usefulness of the radio may be extended to every room in the house, as a set of push buttons and a loud speaker can be installed in each room.

In "December" Issue

"When Fate Tricks Tricksters"
By Dunninger.
(The Story of Harry Kellar)

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French Scientific Sleuth Exposes Glozel Fraud

By Count A. N. Mirzaoff

(*Continued from page 607*)

tion, and probably had kept less than five years. 2—Cotton and linen shreds showed that they were in perfect state of preservation and that they were dyed with modern colorings. 3—The tablets, after being subjected to a water treatment disintegrated rapidly, thus showing that they were placed in the ground a short time ago. Among other conclusions M. Bayle found that a small blade of fern was introduced in an artificial hole in one of the smaller tablets, and was kept in place by means of freshly mixed clay.

Among other objects seized at Fradin's farm was a mass of plastic dry clay which, after microscopic examination, was found to be of the same origin as the material of the other two tablets. However, the material in the medium size tablet was found slightly different in composition, although the clay of which it was made came from the same soil as the others. Furthermore, in the cellar of the museum was found a pot containing wet clay of the same identical composition as the large and the small tablets. Here are some of the details of Bayle's scientific investigations.

First let us examine closely the larger tablet. This is made of a yellowish clay the same as the other two. It measures 13¼ inches long by 10 inches wide and 1¼ inches thick. On one side of the tablet there are some curious signs, which give the evidence of the freshness of the clay at the time when they were carved. A thin coating of dirt resembling varnish covers the entire surface of the tablet. Upon close examination under strong light, both sides of the tablet show minute striations parallel with one another, evidently left by a pen. On the reverse side are seen traces of cloth, and on the corner it was found that unsuccessful attempts were made to erase finger prints left on the tablet.

One of the most important phases of these investigations, was the question—were the tablets baked and to what degree of temperature were they subjected? To answer these questions let us first find out various principles of the properties and the elements in the clay. Since the tablets were made of common clay, which is of sandy earth, they could not have been baked without certain binders, the mineral constituents of which alter at certain temperatures. Several temperature tests were necessary in order to find to what period these tablets belonged. The prepared samples were found still to contain traces of chlorophyllous leaves, moss, grain roots and dyed linen and cotton fibre.

M. Bayle took these samples and subjected them to minute tests in his laboratory. He discovered that the vegetable elements carbonized at 302 degrees F. The majority showed little or no change. Spectroscopic tests showed the grasses in the large tablet to date from between 1920 and 1927. The presence of the vegetable matter showed that the tablets had not been baked, this was confirmed by the chemist's instrument, the polariscope. Thus M. Bayle first determined that if baked the baking process never reached a temperature of 302 degrees F. The rapid crumbling away in water also showed the unbaked nature of the tablets. Some of the finds resisted the action of water. The quartz in the tablets showed that they had never reached a temperature of 1132 degrees F. nor the argillaceous matter 932 degrees F; therefore the tablets were

(*Continued on page 671*)

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(*Continued from page 669*)

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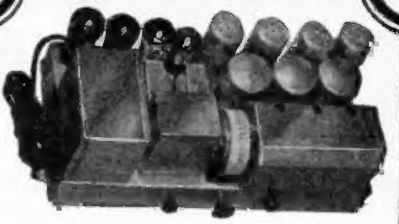

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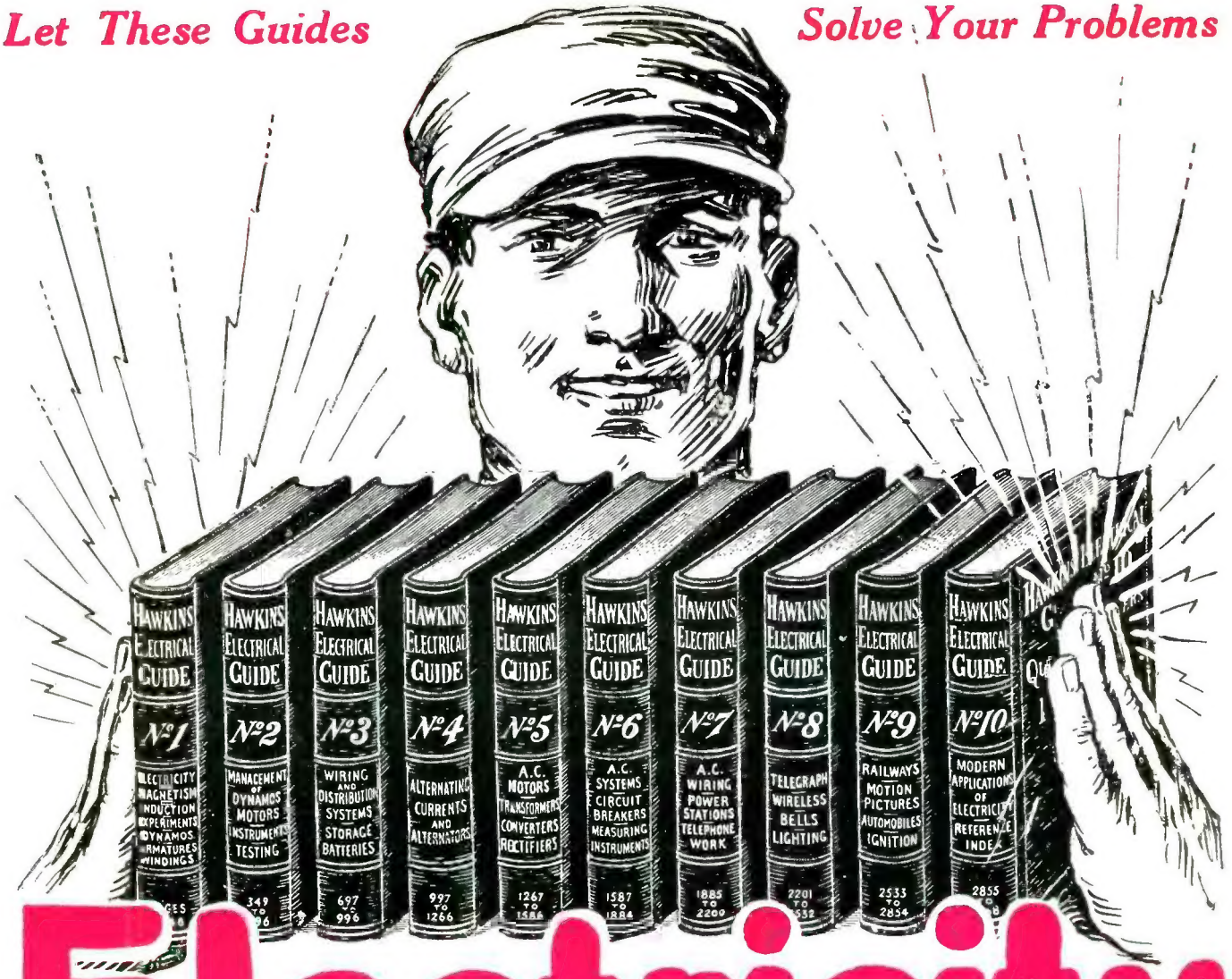

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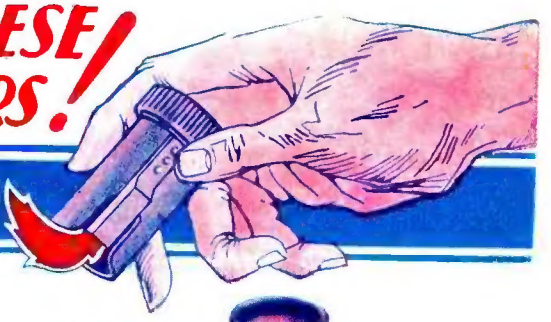
CASH IN NOW WITH THESE 2 BRAND NEW MONEY MAKERS!

LIFT-A-LITE ASH RECEIVER



Here is the biggest hit brought out in recent years. A winning product—a sensational New Money Making Plan. On the right is pictured the new Lift-A-Lite Ash Receiver and Lighter Combination. No illustration can do justice to its real beauty and utility. It must be seen to be appreciated. It's a beauty to look at the greatest convenience to use—takes but a snap to sell. The tray is deep and spacious, 6 inches long by 5 inches wide—hand tooled decoration. Made of durable Bakelite in lustrous colors and beautiful mottled effects in ONYX, RED, BLUEBLAZE, GREEN, MAHOGANY and WALNUT. The lighter works on an entirely new principle. Its exclusive patented features attract instant attention. By simply lifting the cap a light instantly appears. Replace the cap and you enjoy your smoke with the tray handy to rest cigarette and hold ashes. The lighter has no springs or screws to adjust or any parts to get out of order. The working parts are fine gold finished. Everybody is a prospect. Housewives, givers of gifts, club rooms, offices and business houses offer you tremendous sales and profits. Reap a harvest of the biggest profits you ever made in your life by getting behind this sensational big seller now. Our proven successful selling plans will show you how.

Amazing New Advertising Imprint Plan Pays Tremendous Profits
Every Dealer Works For You as Sub-Agent
Only 25 Established Dealers Net You $2500.00 Per Month

We have originated an entirely new selling plan which will bring you big commissions in addition to the profits you make on the sale of this item to dealers. Lift-A-Lite Ash Tray makes a wonderful advertising gift and is designed to be imprinted with customer's ad. Twenty-five million dollars is spent annually in premium advertising. Every business and profession at one time or another—particularly during the holiday season—gives away advertising premiums to their customers or friends. You can cash in the profits on this business **without actually doing the selling.** The neighborhood dealer does that for you.

Here is how the plan works: We have designed a magnificent colorful counter display which automatically sells the consumer. At the same time a special message solicits orders from business men with their ad. The dealer is authorized to take orders at the list price furnished him and collect 25% deposit. This deposit the dealer retains as his profit and mails the order to us. We make shipment direct to the customer and collect the balance. Every order that the dealer sends in will show your name as our distributor. Out of this balance we pay you 25% commission. Advertising orders usually run in large quantities, ranging in lots of 100, 500 to several thousand. Estimating very conservatively, we will assume that a dealer will take orders for only 200 imprinted ash receivers per month, amounting to $500.00. On that basis he will collect 25%, or $125.00. Your commission is also 25% of the balance, or $100.00. If you have only twenty-five established dealers averaging 200 imprinted Lift-A-Lites per month, your commission will amount to $2500.00. Before you appoint any dealer as your subagent for the imprinted lighters, it is necessary that he buy three or six assorted Lift-A-Lite Ash Receivers for resale and display over the counter. Your profit on the resale of Lift-A-Lites to 25 dealers will be $100.00 in addition to the commission you will receive on all of their imprint orders. You can see at a glance what a money coiner this proposition is. You simply can't miss a sale with this plan. Your earnings are only limited by the number of dealers you call on. But this is not all.

$5.00 VALUE
RETAILS FOR
$3.45

Packed in Gift Box

SENSATIONAL FREE OFFER!

To get you started immediately we will send you a sample of the Lift-A-Lite Ash Receiver and De Luxe New Size Money Wallet and Lighter Set as illustrated here, both for the price of only one—$3.45. With these samples in your hands we will prove to you that it is easy to earn $2500.00 a month and more, or you may return the two samples and we will refund you not $3.15 but $4.00 in cash. Mail coupon below!

SAMPLES OF THESE 2 BIG WINNERS *for the price of only one* $3.45

NEW SIZE MONEY DE LUXE WALLET & LIGHTER SET

$5.00 VALUE
RETAILS FOR
$3.45

HERE IS ANOTHER WINNER SELLING BIG

The demand for the new size billfold is tremendous. This new combination of new money wallet and lighter to match is proving a whirlwind seller. Uncle Sam's recent change in the size of his paper currency means big money for you. Every man will want this De Luxe Set. The Wallet is smartly designed of genuine leather with handsomely embossed rose pattern. It is made to meet every requirement of the present day for a handy, convenient wallet to carry both the new size money and old large bills in separate compartments. There is also a change and card purse and a compartment for identification and automobile license. The lighter is of the sure fire type with fine gold finished top and is covered with genuine leather embossed to match the wallet. Sells for only $3.45. You make sales on sight every time you show it.

OUR SIX TESTED PROVEN SELLING PLANS LEAD YOU TO THE BIGGEST EARNINGS YOU EVER MADE

In addition to the advertising imprint plan briefly described above, we have five other plans that will prove big money makers for you. Briefly they are: C. O. D. Plan—You take orders and collect your profit in advance. Initial and Emblem Plan—which brings instant sales and sells every prospect. Sales Board Plan—an extra profit maker. We show you how to build a steady growing repeat business with dealers. Each and every one of these six plans will lead you to big earnings. Full details of all selling plans and selling aids will be sent with your samples.

READ THIS EXTRAORDINARY GUARANTEE

You take no risk. Send for these samples now and when they arrive if you are not satisfied it is the biggest opportunity ever offered for big sales and quick profits, return the samples and we will refund you not $3.45 but $4.00 in cash—50c extra for your trouble. YOU ABSOLUTELY TAKE NO RISK.

RUSH COUPON NOW FOR SPECIAL OFFER

Fill out coupon below, enclose $3.45, or $1.00 deposit, and we will ship C. O. D. for balance. You will receive one Lift-A-Lite Ash Receiver and one new size money De Luxe Wallet and Lighter Set, everything complete as illustrated here—with full details of all our amazing selling plans. There isn't another opportunity that compares with this. Exclusive territory to producers. Act now.

CLIP AND MAIL COUPON TODAY!

GORDON MFG. CO. (Dept. CJ-47)
110 East 23rd St., New York, N. Y.

Your two big winners and selling plans interest me. I accept your special offer. Send me one LIFT-A-LITE ASH RECEIVER and one DE LUXE NEW SIZE MONEY WALLET SET.

Enclosed find ( ) Full Remittance $3.45
( ) $1.00 Deposit (will pay balance on delivery).

It is understood you will refund $4.00 if I return these samples. Please include full details of all your selling plans.

Name .....

Address .....

City..... State.....

GORDON MFG. CO. (Dept. CJ-47) 110 East 23rd St., New York, N. Y.

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